PALYNOTAXONOMIC STUDY OF THE PHYTOLACCACEAE[1]

BY JOAN W. NOWICKE[2]
Department of Botany, Washington University, St. Louis, Missouri

ABSTRACT

The *Phytolaccaceae*, a largely tropical and subtropical plant family, are revised utilizing pollen morphology in addition to floral and vegetative morphology. Seventy-one species, including the novelty *Ercilla syncarpellata* Nowicke, are treated with descriptions of pollen and gross morphology; keys are provided to all major taxa and species. The 17 genera recognized (*Anisomeria, Ercilla, Phytolacca, Gallesia, Seguieria, Rivinia, Trichostigma, Schindleria, Hilleria, Petiveria, Ledenbergia, Monococcus, Agdestis, Microtea, Lophiocarpus, Stegnosperma,* and *Barbeuia*) are placed in six subfamilies (*Phytolaccoideae, Rivinoideae, Agdestioideae, Microteoideae, Stegnospermoideae,* and *Barbeuioideae*) three of which are newly established, with all subfamilies except the *Rivinoideae* (with *Seguierieae* and *Rivineae*) being monotribic. Four major pollen types are recognized: 3-colpate with variations of minor os formation or polar exine thickening; pantoporate; 12-colpate with four colpi forming a square at each pole and four perpendicular to the equator; and 15-colpate with five colpi forming a pentagon at each pole and five perpendicular to the equator. In terms of gross morphology the family is considered relatively primitive with only occasional examples of characters considered advanced. In terms of pollen morphology, the family has advanced types (those other than 3-colpate) well represented.

INTRODUCTION

The *Phytolaccaceae* comprise a weedy family of largely tropical and subtropical plants which have been placed, almost without exception, in the order *Centrospermae* (*Chenopodiales* of Hutchinson, 1959; *Caryophyllales* of Bessey, 1915). It is a relatively natural order, best characterized by its uniform placentation, ovule structure, perisperm storage tissue and the unique presence of betacynanins.

Heimerl (1889), in his survey of the *Phytolaccaceae* for the Pflanzenfamilien, recognized six tribes: *Rivineae* [*Gallesia* Casar., *Seguieria* Loefl., *Monococcus* F. Muell., *Phaulothamnus* A. Gray, *Ledenbergia* Klotzsch, *Rivina* L., *Petiveria* L., *Microtea* Swartz, *Hilleria* Vell. (as *Mohlana* Mart.), *Adenogramma* Reichb.], *Limeae* (*Polpoda* Presl, *Limeum* L., *Barbeuia* Thouars), *Stegnospermeae* (*Stegnosperma* Benth., *Psammotropha* Eckl. & Zey.), *Phytolacceae* (*Phytolacca* L., *Anisomeria* D. Don, *Giesekia* L.), *Gyrostemoneae* (*Didymotheca* Hook. f., *Gyrostemon* Desf., *Tersonia* Moq.), *Agdestideae* (*Agdestis* Moc. & Sesse). He did not recognize *Trichostigma* A. Rich., *Ercilla* Juss. (Ercilia), or *Schindleria* H. Walter as distinct genera, and *Lophiocarpus* Turcz. was not treated but rather included in the *Chenopodiaceae.*

Walter's (1909) monograph was the first comprehensive treatment of the family and he recognized two subfamilies, *Phytolaccoideae* containing 17 genera

---

[1] Based on a dissertation submitted to the Graduate School of Washington University in partial fulfillment of the requirements for the degree of Doctor of Philosophy. Assisted by a Junior Fellowship from the Center for the Biology of Natural Systems and by National Science Foundation Grant No. GB-5042 (Principle Investigator, Walter H. Lewis). Dr. Lewis is gratefully acknowledged for supervision of this research.

[2] Currently Postdoctoral Fellow, Missouri Botanical Garden and Department of Botany, Washington University, St. Louis, Mo.

ANN. MISSOURI BOT. GARD. **55**(3): 294-363, 1969.

(*Anisomeria, Ercilla, Phytolacca, Barbeuia, Didymotheca, Tersonia, Gyrostemon, Codonocarpus* A. Cunn., *Hilleria, Seguieria, Gallesia, Rivina, Trichostigma, Ledenbergia, Schindleria, Petiveria, Monococcus*), *Stegnospermoideae* with only *Stegnosperma, Agdestis* which is not placed in a subfamily or tribe, as well as three other anomalous genera (*Achatocarpus* Triana, formerly placed in the *Amaranthaceae* by Bentham & Hooker, 1883; *Microtea, Phaulothamnus*) with affinities to the *Chenopodiaceae* for a total of 22 genera. He removed six genera (*Limeum, Giesekia, Adenogramma, Psammotropha, Polpoda, Semonvillea* Gay, the last genus Heimerl had treated as a subgenus of *Limeum*) to the subfamily Ficoideae of the *Aizoaceae.* In addition to this major change, he recognized *Ercilla* as distinct from *Phytolacca, Trichostigma* as distinct from *Rivina,* and included his recently established genus, *Schindleria* (Walter, 1906).

In the second edition of Pflanzenfamilien, Heimerl (1934) divided the *Phytolaccaceae* into five tribes: *Rivineae, Phytolacceae, Agdestideae, Stegnospermeae,* and *Barbeuieae,* the last three being monogeneric; in addition he cited two genera, *Microtea* and *Lophiocarpus,* as connecting links to the *Chenopodiaceae.* He reduced the total number of genera to 17 by removing six previously included by Walter (1909) and adding *Lophiocarpus,* a genus formerly placed in the *Chenopodiaceae* (Bentham & Hooker, 1883), and placed by N. E. Brown (1909) in the *Phytolaccaceae* as congeneric with *Microtea.* Four of the genera which Heimerl separated from the *Phytolaccaceae* comprised the *Gyrostemonaceae* (*Gyrostemon, Codonocarpus, Didymotheca, Tersonia*) all of which have unisexual flowers and a high carpel frequency (rarely two or one). The *Achatocarpaceae* was constructed for two dioecious genera, *Achatocarpus* and *Phaulothamnus,* found in the American tropics and subtropics.

Hutchinson (1959) included the *Phytolaccaceae* in the *Chenopodiales;* the latter consists of 10 families of which four resulted from a further division of the *Phytolaccaceae.* The family was consequently reduced to three genera: *Phytolacca, Anisomeria,* and *Ercilla. Agdestis* and *Barbeuia* were placed in monotypic families and the remaining genera, with the exception of *Stegnosperma* which he placed as a monogeneric family in the *Pittosporales,* comprise the *Petiveriaceae* (*Gallesia, Hilleria, Ledenbergia, Lophiocarpus, Monococcus, Microtea, Petiveria, Rivina, Schindleria, Seguieria, Trichostigma*).

Eckardt (1964) made some changes in the larger taxa, recognizing three subfamilies, the *Phytolaccoideae* with four tribes, and the *Stegnospermatoideae* and the *Microteoideae* each with a single tribe. He does not cite all genera, but his treatment appears to follow closely that of Heimerl (1934).

The present work is the first major treatment and revision of the *Phytolaccaceae* in the generic concepts of Heimerl (1934). Although Walter's (1909) monograph is a competent treatment of the family, several serious flaws exist: the familial limits, i.e. inclusion of genera whch have since, justifiably, been removed; and the fact that in many instances, generic as well as specific, the exsiccatae listed could not possibly have permitted an adequate consideration of the wide variation which characterizes the family, with the result that many of the taxa established are

invalid. This study, although incomplete in parts, attempts to coordinate morphological descriptions, including pollen, floral and vegetative, in order to revise the generic and specific limits.

Synopsis of the Phytolaccaceae

Phytolaccaceae Lindl., Nat. Syst. ed. 2, 210, 1836.

Petiveriaceae Link, Handb. **1**: 392, 1829[3].

Herbs, shrubs, or trees. *Leaves* simple, alternate, petiolate to ± sessile, entire, generally estipulate (stipules thorny in *Seguieria*). *Inflorescences* racemes, spikes, or irregular panicles rarely cymules. *Flowers* small, perfect or rarely unisexual (plants then dioecious), ± actinomorphic (weakly zygomorphic in *Hilleria* and *Anisomeria*); calyx composed of 4-5 free or slightly connate segments, dry and inconspicuous or occasionally corolla-like; corolla absent (staminodia petaloid in *Stegnosperma*); stamens 3-∞ (number variable within a species or even an inflorescence), frequently arranged in one or two whorls, sometimes deposited on a hypogynous disc but placed irregularly in relation to sepals or rarely alternate, the filaments linear, or awl-shaped, the anthers mostly linear, tetrasporangiate, introrse (extrorse in *Hilleria*), dehiscing longitudinally; ovary superior (semi-inferior in *Agdestis*), composed of 1-16 free or united carpels, each carpel with one basal, campylotropous ovule, the styles usually equal to the carpel number or absent, the stigmas capitate or ± penicellate or not apparent. *Fruit* a berry, capsule, drupe, utricle, achene or samara; seed one per carpel; embryo curved around a mealy perisperm.

A family of 17 genera and ca 70-80 species mostly in the New World tropics and subtropics, but also found in Africa, Australia and Hawaii.

Economically the family is of little importance, but some species contain partially toxic substances which are used medicinally. The roots and fruits of some contain Saponin, which can be utilized as a soap. *Phytolacca dioica* L. is frequently planted as a shade tree in the tropics because it is fast growing. The berries of some *Phytolacca* spp. have been utilized as an adulterant of red wine, and the young sprouts and leaves can be made into a "poke salad".

Pollen

Pollen grains single, prolate, subprolate or prolate spheroidal, ca 16-35μ (E) × ca 18-39μ (P), 3-colpate, 3-colporoidate, 12-colpate in a 4-4-4 pattern, 15-colpate in a 5-5-5 pattern, or pantoporate, exine ca 1.5-3μ in thickness, sometimes thickened at the poles to 5μ, sexine ± equal to or slightly thicker than nexine and sparsely small spinulose to ± smooth (see Appendix).

---

[3] The name *Phytolaccaceae* is conserved over *Petiveriaceae*.

Cytology

Relatively few chromosome counts are available for the family, but all evidence points to a base of $x = 9$ (18).

Hilleria latifolia H. Walter	$2n = 36$	(Mangenot & Mangenot, 1958).
Petiveria alliacea L.	$2n = 72$	(Sugiura, 1937).
Phytolacca acinosa Roxb.	$2n = 36$	(Sugiura 1936b).
P. americana L.	$2n = 36$	(Bostick, 1965, N. C.; Lewis et al., 1962, Texas).
P. australis Phil.	$n = 18$	(Heiser, 1963).
P. dioica L.	$2n = 36$	(Schnack & Covas, 1947).
P. octandra L.	$2n = 36$	(Sugiura, 1936a).
Rivina humilis L.	$2n = 108$	(Nowicke, 1967; Sugiura, 1936a).

Anatomy

The entire order *Centrospermae* is characterized by its distinctive stem structure (essentially anomalous secondary thickening) and according to Metcalfe & Chalk (1950) certain genera in the *Phytolaccaceae* (*Agdestis, Anisomeria, Barbeuia, Gallesia, Petiveria, Phytolacca, Seguieria*) have successive rings of vascular bundles in the inner parenchymatous portion of the pericycle. Concentric rings of xylem and phloem occur in sufficiently thick stems of *Ercilla, Gallesia, Phytolacca, Rivina* and *Seguieria.*

Another distinctive feature of the *Phytolaccaceae,* as well as the entire order, is found in the character of its pigments. It is one of the "beta-cyanin families" (Dreiding, 1961), which are closely related and characterized by their inability to produce anthocyanins which is replaced by the ability to synthesize betacyanins (and betaxanthins).

Taxonomy

In this treatment I recognize six subfamilies, all monotribic with the exception of *Rivinoideae* which is divided into two tribes based primarily on the striking differences in fruits and types of inflorescences.

I. *Phytolaccoideae* H. Walter—ovary of 3-16 carpels, free or united; fruit a drupe, achene or berry. 3 genera: *Anisomeria, Ercilla, Phytolacca.*

II. *Rivinoideae* Nowicke—ovary of one carpel and one seed; fruit an achene, drupe, utricle or samara. 9 genera: *Gallesia, Seguieria, Rivina, Trichostigma, Schindleria, Hilleria, Petiveria, Ledenbergia, Monococcus.*

III. *Microteoideae* Eckardt ex Nowicke—ovary of one carpel with 2-4 stigmas and one seed; fruit an achene. 2 genera: *Microtea, Lophiocarpus.*

IV. *Agdestioideae* Nowicke—ovary of 3-4 carpels, 3-4 stigmas, semi-inferior, and one seed. One genus: *Agdestis.*

V. *Stegnospermoideae* H. Walter—ovary of 3-5 united carpels, 3-5 seeds, petaloid staminoidia; fruit a capsule. One genus: *Stegnosperma.*

VI. *Barbeuioideae* Nowicke—ovary of 2 united carpels, 2 seeds; fruit a capsule. One genus: *Barbeuia.*

KEY TO THE SUBFAMILIES

a. Fruit(s) a capsule, 2 or 3-5 locular.
  b. Capsule 2-locular; inflorescences axillary cymules or fascicles; staminodia absent; plants drying black; endemic to the Malagasy Republic
  bb. Capsule 3-5 locular; inflorescences racemes, sometimes cymules; staminodia petaloid; plants drying green; Central America and the West Indies .....subf. V *Stegnospermoideae* (p. 356)

aa. Fruit(s) a berry, drupe, samara, achene, or utricle. .....subf. VI *Barbeuioideae* (p. 358)
  c. Ovary of 3-16 carpels, free or united.
    d. Ovary semi-inferior, with 3-4 united carpels and 3-4 stigmas; seed one; ± woody vines; leaves cordate .....subf. IV *Agdestioideae* (p. 355)
    dd. Ovary superior, 3-16 free or united carpels and one stigma per carpel; seeds as many as the carpels; herbs, shrubs or trees; leaves variable, but not cordate .....subf. I *Phytolaccoideae* (p. 298)
  cc. Ovary of one carpel, with one seed.
    e. Ovary with one stigma; fruit a samara, drupe or utricle, or if an achene then not globose, and conspicuously 4-6 hooked or covered with recurved spines .....subf. II *Rivinoideae* (p. 320)
    ee. Ovary with (2-)3-4 stigmas; fruit an achene, globose with pericarp wrinkled, glochidiate, warty or ridged .....subf. III *Microteoideae* (p. 346)

PHYTOLACCOIDEAE

I. Subf. *Phytolaccoideae* H. Walter, Pflanzenr. IV, 83 (Heft 39): 29, 1909. (Type *Phytolacca* L.)

Tribe *Phytolacceae* Reichb., Fl. Exc. 586, 1832. (Type *Phytolacca* L.)

a. Carpels distinctly free; sepals unequal and ± fleshy; leaves succulent-leathery; inflorescences mostly terminal .....1. *Anisomeria*
aa. Carpels free or united; sepals equal or only weakly unequal and thin; leaves not succulent-leathery; inflorescences axillary or terminal.
  b. Carpels usually free, rarely united; inflorescences dense, short, axillary spikes, rarely raceme-like; shrubs of Chile .....2. *Ercilla*
  bb. Carpels free or united, usually united; inflorescences racemes or ± long spikes; mostly herbs; cosmopolitan .....3. *Phytolacca*

1. ANISOMERIA

Anisomeria D. Don, Edinb. New Phil. Jour. **13:** 238, 1832. (Type *A. coriacea* D. Don)

Pircunia Bertero, Mercurio Chileno 744, 1829; Amer. Jour. Sci. **23:** 264, 1833, non Moq. (in DC., Prodr. **13**(2):29, 1849).

Herbs or shrubs, sometimes succulent, calcium oxalate crystals present. *Leaves* alternate or in fascicles of ca 3, ovate, ovate-elliptic, or ± spatulate, mucronate, retuse or rounded, entire or slightly undulate, the bases rounded to attenuated, glabrous, ± leathery; sessile to petiolate, petioles sometimes thickened at the base in fascicular arrangement and appearing stipular. *Inflorescences* spikes or spike-like racemes, mostly terminal. *Flowers* perfect, ± zygomorphic; sessile or pedicellate; bract single or absent; bracteoles 2 and fleshy, or absent; sepals 5, unequal, ± united at the base, orbicular, fleshy; stamens 10-20, appearing in two whorls, the filaments ± thickened; ovary 5-8 carpellate, free, the styles as many as the carpels, the stigmas inconspicuous to slightly thickened. *Fruit* a loose collection of drupelets (?), red to brown; seed one (Fig. 1).

This genus of three species has been described as restricted to Chile; however,

some locations cited on herbarium specimens are from the Chilean-Argentinean border.

Pollen grains single, prolate, ca 26μ (E) × ca 34-39μ (P), 3-colpate, colpi ca 23-32μ long, the exine ca 2-3μ in thickness, sexine ± equal to or slightly thicker than nexine and finely reticulated (Fig. 4).

The publication of Bertero (1829) does predate that of Don, but the descriptions of the former author are seminude and until I see collections of Bertero which have definitely been determined by him as *Pircunia drastica*, and thus leave no doubt as to the plant described in the Mercurio Chileno publication, I think the generic name *Anisomeria* should remain.

Two names have deliberately been omitted from the following synonomy, namely, *Anisomeria coriacea* var. *petalifera* H. Walter (Pflanzenr. IV, 83 (Heft 39): 32, 1909) which may well be a variety of *A. fruticosa* Phil. judging from the thickened filaments of the latter; however, since I have not seen petaloid specimens, I withhold judgment. The other name, *A. densiflora* H. Walter (loc. cit.), does not apply in my opinion to a distinct species, but could, because of the immaturity of the inflorescence, be placed in synonomy under either *A. coriacea* D. Don or *A. fruticosa*. I tend to favor the former reduction because the leaves of the type (*Lechler s.n.* photo F, from B†) resemble those of *A. coriacea*, which agrees with Walter's (1909) description.

Fig. 1. Inflorescences of *Anisomeria* D. Don. A, *A. littoralis* (Poepp. & Endl.) Moq. (×1); B, *A. coriacea* G. Don (×½); C, *A. fruticosa* Phil. mature and immature inflorescences. A after *Grandjot s.n.* (MO); B after *Grandjot s.n.* (MO); C after *Werdermann* 785 (MO).

The genus is clearly related to *Phytolacca* and is distinguished by its rather weak zygomorphic condition, fruit type and, to a greater or lesser extent, its general habit.

a. Flowers sessile .....1. *A. coriacea*
aa. Flowers pedicellate.
  b. Inflorescences < 8 cm long, pedicels mostly 4 mm or longer .....2. *A. littoralis*
  bb. Inflorescences > 10 cm long, pedicels mostly 2-2.5 mm at maturity ....3. *A. fruticosa*

1. *Anisomeria coriacea* D. Don, Edinb. New Phil. Jour. **13:** 238, 1832. (Type *Cuming s.n.* G?)

Pircunia drastica Bertero, Mercurio Chileno 744, 1829; Amer. Jour. Sci. **23:** 264, 1833.
Phytolacca drastica (Bertero) Poeppig & Endl., Nov. Gen. Sp. Pl. **1:** 26, *pl. 43, 44,* 1835.
Anisomeria drastica (Bertero) Moq. in DC., Prodr. **13**(2): 25, 1849.

Shrubs, weak, or succulent herbs with woody bases. *Leaves* mostly alternate, ovate, rarely lanceolate or spatulate, mucronate, undulate, the bases attenuate, up to 6 cm long and 3 cm wide, succulent to leathery; petiole indistinct. *Inflorescences* spikes, up to 25 cm long, terminal. *Flowers* sessile; bract single, ca 2-2.5 mm long, lanceolate; bracteoles absent (?); sepals 5(-6), ± unequal, rounded, ca 3 mm long and 3-4 mm wide; stamens ca 20, in two irregular whorls, the filaments linear, ca 2.5-2.9 mm long, the anthers ca 1.7-1.9 mm long; ovary 5-6 carpellate, free, the styles as many as the carpels and ca 1.5-2 mm long, the stigma on the upper surface. *Drupelets* 5-6, red-brown, ca 8 mm long, style ± persistent (Fig. 1B).

Chile[4]: coquimbo: s. loc., *Gay s.n.,* (G, NY). santiago: nr Juncal, *Elliot 631* (K); vic of Santiago, *Grandjot s.n.,* in 1932 (MO). without province: *Reed s.n.* (K); *Bridges 526* (K).

Pollen grains ca 39μ (P), colpi ca 32μ long, exine ca 3μ in thickness, sexine somewhat thicker than nexine.

Pollen examined: *Grandjot s.n.* (MO).

2. *Anisomeria littoralis* (Poepp. & Endl.) Moq. in DC., Prodr. **13**(2): 25, 1849.

Phytolacca chilensis Miers, Trav. **2:** 532, 1826, nom. nud.
P. littoralis Poepp. & Endl., Nov. Gen. Sp. Pl. **1:** 27, *pl. 45,* 1835. (The plate is taken as the type)
Anisomeria chilensis Miers ex H. Walter, Pflanzenr. IV, 83(Heft 39): 33, 1909, non *Phytolacca chilensis* (Miers ex Moq.) H. Walter [Pflanzenr. IV, 83 (Heft 39): 45, 1909].

Shrubs. Leaves mostly fasciculate, ovate-elliptic, obtuse, mucronate or retuse, lamellate, the bases obtuse or rarely attenuate, up to 5 cm long and 2 cm wide, succulent to leathery; petioles to 1.5 cm long, becoming swollen and woody at the base. *Inflorescences* racemes (appearing as a spike in bud), mostly terminal, up to 7 cm long. *Flowers* with pedicels up to 6 mm long at maturity; bract absent; bracteoles two, ca 0.6-0.7 mm long, located ca midway on pedicel; sepals 5, unequal, somewhat united at the base, ca 2 mm long, and ca 0.6-2 mm wide,

[4] The geographical citation procedure is: large countries of S. America, the province or state, the location, then alphabetically by collector; Mexico and the United States, the state, then alphabetically by collector; large countries of Africa, Australia, and Asia, the location or province, then alphabetically by collector; all others, alphabetically by collector.

± orbicular; stamens 10-20, the filaments ca 2 mm long, stout, the anthers ca 1.2 mm long; ovary 5-8 carpellate, free, the styles as many as the carpels, thick, short, strongly recurved, the stigma on the upper surface. *Drupelets* 3-5, green-brown, ca 8-9 mm long (Fig 1A).

CHILE: COQUIMBO: vic of lower Choros River, *Reed s.n.* (K); estate of Frai Jorge, *Munoz B161* (GH), *B218* (GH); *Skottsberg & Skottsberg 763* (F, NY). SANTIAGO: vic of Santiago, *Grandjot s.n.*, in 1935 (MO). VALPARAISO: Algarrobo, *Kausel 4339* (F); Quillota, *Bertero 1233* (MO).

Pollen grains ca 34μ (P), colpi ca 23μ long, exine ca 2-2.5μ in thickness, sexine ± equal to nexine.

Pollen examined: *Grandjot s.n.* (MO); *Skottsberg & Skottsberg 763* (NY) (Fig. 4).

It is unfortunate that Walter (1909) applied the nude name *Phytolacca chilensis* Miers to two different taxa, a species of *Anisomeria* and one of *Phytolacca.* Since it is impossible as yet to determine to which entity Miers referred, even though I have seen Miers collections of *Anisomeria,* I have applied it to a bona fide species of *Phytolacca.*

3. *Anisomeria fruticosa* Phil., Linnaea **29:** 38, 1857-1858. (Type *Philippi 873* photo F, from B†)

Shrubs. Leaves mostly alternate, ovate, rounded to retuse, entire, the bases rounded to obtuse, up to 6 cm long and 4 cm wide, ± leathery; petioles to 12 mm long, the bases ± thickened and woody. *Inflorescences* spike-like racemes, up to 20 cm long, mostly terminal. *Flowers* with pedicels ca 2-2.5 mm long at maturity; bract absent; bracteoles two, ca 1 mm long; sepals 5, slightly united at the base, unequal, ± orbicular, ca 2.5-3 mm long and 0.6-2.2 mm wide; stamens 10-20, the filaments ca 2 mm long and ca 0.8 mm wide, fleshy, the anthers ca 1 mm long; ovary 6-7 carpellate, free, the styles as many as the carpels, short, thick and recurved, the stigmas on the upper surface. *Drupelets* 6-7, up to 1 cm long (Fig. 1C).

CHILE: ANTOFAGASTA: vic of Taltal, *Johnston 5195* (GH), *5611* (GH); *Werdermann 785* (F, K, MO, NY).

Pollen grains ca 34μ (P), colpi ca 24-25μ long, exine ca 2-2.5μ in thickness, sexine ± equal to nexine.

Pollen examined: *Werdermann 785* (MO).

2. ERCILLA

Ercilla A. Juss., Ann. Sci. Nat. **25:** 11, 1832; Edinb. New Phil. Jour. **14:** 261, 1833. [Type *E. spicata* (Bert.) Moq.]

Suriana Domb. & Cav. ex D. Don, loc. cit. 13: 238, 1832.
Bridgesia Hooker & Arnott in Hooker, Bot Misc. **3:** 168, *pl. 102,* 1833, pro parte, non *B. incisifolia* Bertero, (*Bertero 1361* photo NY, from G).
Ercilia Endl., Gen. Sp. Pl. 977, 1840.
Apodostachys Turcz., Bull. Soc. Nat. Hist. Moscou **21**(1): 577, 1848.

Shrubs. Leaves ovate to ovate-orbicular to ovate-elliptic, acute to retuse-mucronate, entire to very finely undulate, the bases slightly cordate to obtuse, ±

papery to coriaceous, glabrous; petiolate. *Inflorescences* spikes or spike-like racemes, mostly axillary, rarely terminal, densely flowered. *Flowers* sessile to shortly pedicellate; bract single; bracteoles 2, closely appressed to sepals; sepals 5, ± equal free, ovate to ± elliptic, turning black on dessication; stamens 8-12, free, inserted on a hypogynous disc; ovary 4-8 carpellate, free or united, the styles as many as the carpels and free, slender, the stigmas not apparent. *Fruit* a loose collection of drupelets (?) or berry (?); seeds 1-7.

Chile.

Pollen grains single, prolate, ca 19-20μ (E) × ca 27μ (P), 3-colpate, colpi ca 20-22μ long, exine ca 2μ in thickness, sometimes thickened at the poles to ca 2.5-3μ, sexine ± equal to nexine and sparsely small spinulose.

Heimerl (1934) stated that *Ercilla spicata* (Bertero) Moq. is the sole species of the genus, for *E. volubilis* Juss. scarcely differs from it. Walter (1909) recognized both and separated the two by leaf texture, viz. coriaceous in *E. spicata* and papery in *E. volubilis*, and by the sunken condition of the midvein in the former. Both leaf texture as well as shape vary widely in the genus, although there are, admittedly, some very leathery-leaved specimens. Walter's description of *E. volubilis* is based on a single collection, *Dombey 944*, which he cites as being from Peru, and which Harms in a footnote (Heimerl, 1934) states as being a doubtful location for the genus, a conclusion with which I agree, especially since the NY specimen of this collection is marked Chile. This particular sheet of *Dombey 944* is unusual in that it may represent a mixed collection since the inflorescences of the two specimens are somewhat different, the one on the right having spike-like racemes, the left one having shorter spikes. For the present I am recognizing two species based on carpel condition, i.e. free or united, and am treating all free carpellate specimens as *E. spicata*.

a. Carpels free ..... 1. *E. spicata*
aa. Carpels united, the styles free ..... 2. *E. syncarpellata*

1. *Ercilla spicata* (Bertero) Moq. in DC., Prodr. **13**(2): 35, 1849. (Type *Dombey 944* G, NY)

Galvezia spicata Bertero, Mercurio Chileno 642, 1829.
Ercilla volubilis A. Juss., Ann. Sci. Nat. **25**: 11, *pl. 3, fig. 1*, 1832.
Suriana volubilis (A. Juss.) Domb. & Cav. ex D. Don, Edinb. New Phil. Jour. **13**: 238, 1832.
Bridgesia spicata Hooker & Arnott in Hooker, Bot Misc. **3**: 169, *pl. 102*, 1833. (Syntypes: *Bridges s.n.* BM; *Cuming 349* K; *Mathews 244*, not seen)
Apodostachys densiflora Turcz., Bull. Soc. Nat. Moscou **21**(1): 577, 1848. (Type *Bridges s.n.* BM)
Phytolacca volubilis (A. Juss.) Heimerl, Pflanzenfam. **3**(1b): 11, 1889.

Shrubs. *Leaves* up to 8 cm long and 5.5 cm wide; petioles to 1.5 cm long. *Inflorescences* mostly spikes, rarely spike-like racemes, up to 10 cm long. *Flowers* mostly sessile, rarely with pedicels to 1 mm long; bract single, ca 2.2-2.8 mm long, ± elliptic; bracteoles two, ca 1.7-2.4 mm long; sepals ovate, ca 3.5-5 mm long; stamens 8-10(-12), the filaments 5-6 mm long, the anthers ca 1.6 mm long; ovary 4-8 carpellate, free, the styles ca 1.2-1.6 mm long, recurved. *Drupelets* 4-8, reniform, ca 4-5 mm long; seed ca 3.5-4 mm long, testa shiny black.

CHILE: CONCEPCIÓN: vic of Concepión, *Macrae s.n.* (K). MAULE: Cauquenes, *Joseph 1822* (US). O'HIGGINS: Donihue, *Bertero 289* (GH). VALDIVIA: Chinguil, *Hollermayer 1922* (NY, US); Coral, *Buchtien s.n.* (US); Panguipulli Lake, *Joseph 2405* (US); s. loc., *Philippi s.n.* (US). VALPARAISO: s. loc., *Cuming 349* (K); *Bertero 289* (GH). WITHOUT PROVINCE: *Gay 362* (NY, US), *s.n.* (K, NY, US); *Dombey 944* (NY); *Joseph 4398* (US).

Pollen grains ca 20μ (E), colpi ca 20μ long, exine thickened at the poles to ca 2.5-3μ in thickness.

Pollen examined: *Gay 362* (NY).

2. *Ercilla* **syncarpellata** Nowicke, sp. nov.

Inflorescentiae spicato-racemosae; flores pedicellis ca 1.5 mm longis; antherae ca 1.5-1.6 mm longae; ovarium brevi gynophoro, 5-7 carpellatum, carpellisque connatis.

Shrubs. Leaves ovate-elliptic, acute-mucronate, entire, the base obtuse to slightly cordate or oblique, up to 7 cm long and 3 cm wide, ± coriaceous, petioles up to 6 mm long. *Inflorescences* spike-like racemes, up to 8.5 cm long, mostly axillary. *Flowers* with pedicels ca 1.5 mm long; bract single, ca 2-2.8 mm long, awl-shaped; bracteoles two, ca 1-1.3 mm long; sepals 3-4 mm long; stamens ca 10, the filaments ca 5-6 mm long, the anthers ca 1 mm long; ovary on short gynophore, ca 0.5 mm long, 5-7 carpellate, united, the styles separate or closely appressed at the bases, recurved, the stigmas on the upper surface. *Fruit* unknown.

Holotype: Chile. Valdivia: La Aguade, *Gunckel 1837* (MO), 15 Nov 1930; isotype GH.

CHILE: VALDIVIA: Coral, *Gunckel 62* (BM); *Krause s.n.* (US).

Pollen grains ca 19μ (E), colpi ca 22μ long, exine not noticeably thickened at the poles.

Pollen examined: *Krause s.n.* (US).

3. PHYTOLACCA

Phytolacca L., Sp. Pl. 441, 1753. (Type *P. americana* L.)
Phytholacca Brot., Fl. Lusit. **2**: 224, 1804.
Sarcoca Raf., Fl. Tellur. **3**: 55, 1836.
Pircunia Moq. in D.C., Prodr. **13**(2): 29, 1849, non Bertero (Mercurio chileno 744, 1829).

Trees, shrubs or herbs; calcium oxalate crystals ± conspicuous. *Leaves* lanceolate to ovate or rarely ± deltoid, acute, acuminate, mucronate, retuse-mucronate, entire, rarely finely undulate, the bases rounded, obtuse, or attenuate, rarely ± oblique, ± glabrous; subsessile or petiolate. *Inflorescences* racemes or spikes, rarely racemes with thyrsiform bases, axillary or terminal, ± scurfy to pubescent. *Flowers* perfect, or unisexual and plants dioecious, mostly actinomorphic; sessile or pedicellate; bract single, rarely absent, narrowly-lanceolate to awl-shaped; bracteoles two, rarely absent, lanceolate to awl-shaped; sepals 5, rarely 4 (-9), narrow-oblong, oblong, elliptic, oblanceolate or ovate, white to red; stamens functional or rudimentary, 8-25, deposited irregularly in one or two whorls, generally on a hypogynous disc, the filaments sometimes widened at the bases; ovary absent, rudimentary or functional, sometimes on a short gynophore, 5-16 carpellate, free or united, the styles as many as the carpels, the stigmas on the upper surface.

Fruit a berry, ribbed, or a loose collection of drupelets (or achenes ?); seeds 5-16 for berry, one for drupelet, reniform, testa shiny black.

Cosmopolitan in distribution but principally in the warmer regions.

Pollen grains single, prolate spheroidal, subprolate, or prolate, ca 17-29μ (E) $\times$ ca 25-36μ (P), 3-colpate, colpi ca 17-26μ long, exine ca 2-2.5μ in thickness, sometimes slightly thickened at the poles, sexine $\pm$ equal to nexine, rarely 2$\times$ as thick, and finely reticulated to sparsely small spinulose (Fig. 7).

Without exception, *Phytolacca* is the most difficult genus in the *Phytolaccaceae* in which species can be accurately defined or classified. The problem lies principally with the fact that many taxa hybridize readily (Fassett & Sauer, 1950; Sauer, 1951), thus obscuring the characters by which they are recognized. In addition infraspecific variability and even extensive variation in the same specimen, e.g. inflorescences in which the flowers may have either one or two staminal whorls, contribute to the difficulty. An illustration of the type of problem encountered in species differentiation is the occurence of inflorescences which are thyrsiform at the base—a character supposedly best delimiting two South American species, *P. thyrsiflora* Fenzl. and *P. sanguinea* H. Walter. However this same character can be observed to a disturbing extent in *P. americana* L., to a lesser degree in *P. heterotepala* H. Walter and even in specimens collected in Asia.

The best characters to delimit taxa in this problematical genus should of course be qualitative, but it appears that many of these parameters are under weak genetic control. Heimerl (1934) noted that the approximately 35 species described are in part very closely related and are difficult to distinguish. In my opinion there are far less than 35 distinct species of *Phytolacca*; many names have undoubtedly been assigned to specimens of hybrid origin.

A discussion of all species which have been described is not feasible here, and I am, for the most part, revising and amending the species in the sense of Walter's (1909) treatment.

Walter (1909) placed 26 species of *Phytolacca* into three subgenera based on the degree of connation of the carpels: free, connate at the base with the apices free, or completely united carpels. Subgenus 1 *Pircunia* (Moq.) H. Walter contains *P. heptandra* Retz, *P. esculenta* van Houtte, *P. acinosa* Roxb., *P. latbenia* (Buch.-Ham.) H. Walter, and *P. cyclopetala* H. Walter in the sect. 1 *Pircuniastrum* Moq., characterized by hermaphroditic flowers, and *P. dodecandra* L'Herit, *P. goudotii* Briq., and *P. nutans* H. Walter in the sect. 2 *Pircunioides* H. Walter, characterized by dioecious plants. Subgenus 2 *Pircuniopsis* H. Walter, characterized by carpels connate at the base with the apices free, contains a hermaphroditic group, the sect. 1 *Pircuniophorum* H. Walter, with three species, *P. chilensis* (Miers ex Moq.) H. Walter, *P. sanguinea* H. Walter, and *P. rugosa* A. Br. & Bouche, as well as the sect. 2 *Pseudolacca* Moq., with two dioecious species *P. dioica L.* and *P. weberbaueri* H. Walter. Subgenus 3 *Euphytolacca* Moq., the largest group and characterized by carpels completely united contains a very large hermaphroditic sect. 1 *Phytolaccastrum* H. Walter with *P. thyrsiflora* Fenzl, *P. heterotepala* H. Walter, *P. brachystachys* Moq., *P. americana* L., *P. polyandra* Batalin, *P. rivinoides* Kunth & Bouche, *P. meziana* (J. D. Smith) H. Walter, *P.*

micrantha H. Walter, *P. australis* Phil., *P. octandra* L., *P. purpurascens* A. Br. & Bouche, and *P. icosandra* L., and a monotypic dioecious sect. 2 *Phytolaccoides* H. Walter containing *P. pruinosa* Fenzl.

The degree of carpel connation upon which Walter (1909) based the three subgenera functions well for recognition of the subg. *Pircunia,* with its completely separate carpels, a condition which is unmistakable in fruit, but for distinguishing the subg. *Pircuniopsis,* with carpels connate at the base, from subg. *Euphytolacca,* with carpels completely united, it is a difficult character. However, in view of the fact that I am not monographing the genus and do not wish to add further to the taxonomic and nomenclatural confusion by making an unmeaningful change, I think it best at this time to maintain the subgenera as outlined by Walter.

The dioecious species are a unique problem, not only in subgeneric classification of male specimens, but also because some species have female flowers with normal appearing stamens. These may be mistaken for functionally perfect flowered species.

A useful, if not essential, criterion for classifying material of *Phytolacca* is geographic location. It is unfortunate, however, that so many binomials seem to be based primarily on this feature; in some instances location is the key to rapid and accurate identification, e.g. Cyprus and *P. pruinosa.* A knowledge of the species commonly found in a particular region can also aid in recognition of hybrids. Specimens from the northern regions of South America are the most perplexing, due to the large number of species found there and to the almost continuous variability of their characteristics.

In this treatment I am recognizing 20 species, but in some instances do so with misgivings. Most of the latter involve specimens where geographic location is apparently the only feature which distinguishes them as species. Examples are *P. brachystachys* from the Hawaiian Islands, which is very similar to *P. rugosa* of Central and South America, and *P. purpurascens* from Haiti, which may very likely be a hybrid of *P. icosandra* and *P. americana* or *P. rivinoides.*

Following Walter's (1909) infrageneric classification in his subg. 1 sect. 1, I recognize *P. heptandra,* but have reduced *P. esculenta* to *P. acinosa.* To my knowledge, I have not seen *P. latbenia* or *P. cyclopetala,* but this does not deny their existence; they are unfortunately omitted. In his dioecious sect. 2 I recognize *P. dodecandra,* yet doubt the validity of *P. goudotii* and *P. nutans.*

In his subg. 2 sect. 1, I recognize *P. sanguinea, P. rugosa,* and *P. chilensis.* In the dioecious sect. 2, I recognize both species cited by Walter, *P. dioica* and *P. weberbaueri,* even though I have not included a description of the latter because I have seen only a male specimen. I am also including here *P. tetramera* Hauman-Merck, which Walter neglected.

In the subg. 3 sect. 1, I follow Walter's treatment rather closely, with the following exceptions: *P. polyandra* I have not seen and omit; *P. heterotepala* and *P. meziana* I include, but with reservations that they may be of hybrid origin; and *P. micrantha* and *P. australis* are reduced to *P. bogotensis* H.B.K. In the monotypic dioecious sect. 2, I recognize *P. pruinosa.*

In accordance with the Code, I have changed the subg. 3 *Euphytolacca* sect. 1 *Phytolaccastrum*, which contains the type species, to the subg. *Phytolacca*, sect. *Phytolacca*.

a. Carpels completely free ..... subg. 1 *Pircunia*
  b. Flowers perfect ..... sect. 1 *Pircunia*
    c. Slender herbs; inflorescences few-flowered spikes, rarely racemes; Africa. ..... 1. *P. heptandra*
    cc. Robust herbs; inflorescences dense racemes; Asia ..... 2. *P. acinosa*
  bb. Flowers functionally pistillate or staminate, but with rudimentary stamens or carpels ..... sect. 2 *Pircunioides* 3. *P. dodecandra*

aa. Carpels ± united.
  d. Carpels with apices ± free, styles not connivent ..... subg. 2 *Pircuniopsis*
    e. Flowers perfect ..... sect. 1 *Pircuniophorum*
      f. Inflorescences dense racemes, thyrsiform at the base ..... 4. *P. sanguinea*
      ff. Inflorescences open racemes, not thyrsiform at the base, or elongate spikes.
        g. Inflorescences racemes; Central America & northern South America ..... 5. *P. rugosa*
        gg. Inflorescences spikes; Chile ..... 6. *P. chilensis*
    ee. Flowers pistillate or staminate ..... sect. 2 *Pircuniopsis*
      h. Leaves spatulate, without a sharply defined petiole; sepals 4.. 7. *P. tetramera*
      hh. Leaves ± ovate, the petiole well-defined; sepals 5.
        i. Inflorescences ca 10 cm long or less; filaments 3.5 mm long ..... 8. *P. dioica*
        ii. Inflorescences ca 25 cm long or more; filaments ca 6-6.5 mm long; very robust ..... 9. *P. weberbaueri*
  dd. Carpels completely united, the styles ± connivent ..... subg. 3 *Phytolacca*
    j. Flowers perfect ..... sect. 1 *Phytolacca*
      k. Inflorescences spikes; flowers sessile to pedicels ca 1 mm long.
        l. Inflorescences longer than leaf lengths; usually two staminal whorls. ..... 10. *P. icosandra*
        ll. Inflorescences equal to or less than leaf lengths; one staminal whorl. ..... 11. *P. octandra*
      kk. Inflorescences racemes, sometimes thyrsiform, the flowers pedicellate.
        m. Racemes extended, thyrsiform at least at the base; chiefly Brazil. ..... 12. *P. thyrsiflora*
        mm. Racemes not thyrsiform at the base, or if so then from North America.
          n. Flowers mostly with two staminal whorls.
            o. Sepals unequal, one noticeably more narrow; western North America. ..... 13. *P. heterotepala*
            oo. Without the above combination.
              p. Sepals oblong, ca 4 mm long; Guatemala .... 14. *P. meziana*
              pp. Sepals ± ovate, < 4 mm long.
                q. Racemes very long, ca 40-50 cm; pedicels ca 7-13 mm; carpels 10-16. ..... 15. *P. rivinoides*
                qq. Racemes less than 30 cm long; pedicels < 7 mm long; carpels ca 9-10. ..... 16. *P. purpurascens*
          nn. Flowers mostly with one staminal whorl.
            r. Plants of Hawaii; carpels mostly 5-6 ..... 17. *P. brachystachys*
            rr. Plants of North or South America; carpels mostly 7-10.
              s. Inflorescences dense racemes; plants of South America ..... 18. *P. bogotensis*
              ss. Inflorescences ± open racemes; plants of North America ..... 19. *P. americana*
    jj. Flowers pistillate or staminate ..... sect. 2 *Phytolaccoides* 20. *P. pruinosa*

SUBG. 1 PIRCUNIA (Moq.) H. Walter, Pflanzenr. IV, 83 (Heft 39): 38, 1909. (Type *P. acinosa* Roxb.)

Pircunia Moq. in DC., Prodr. **13**(2): 29, 1849, non Bertero (Mercurio chileno 744, 1829).

SECT. 1 PIRCUNIA

sect. *Pircuniastrum* Moq. in D.C., Prodr. **13**(2): 29, 1849.

1. *Phytolacca heptandra* Retz., Obs. **6**: 29, 1791.

P. stricta Hoffm., Comm. Götting. **12**: 27, 1796.
P. resediformis Moq. in DC., Prodr. **13**(2): 30, 1849, nom. nud. pro syn. *Pircunia stricta* var. *residiformis*.
P. resedifolia Moq., loc. cit., nom. nud. pro syn. *Pircunia stricta* var. *residiformis*.
Pircunia stricta Moq., loc. cit. (Type *Ecklon & Zeyher s.n.* P)
P. stricta var. *resediformis* Moq., loc. cit. (Type *Ecklon & Zeyher s.n.* P)
P. stricta var. *latifolia* Moq., loc. cit. (Type *Drège s.n.* G, not seen, in IDC Micro-Edition, Candolle Prodromi Herbarium)

Herbs, slender, to ca 1 m. *Leaves* lanceolate-elliptic, rounded-mucronate, entire, the bases obtuse, up to 10 cm long and 2.5 cm wide; ± sessile to petioles 1 cm long. *Inflorescences* spikes or spike-like racemes, up to 13 cm long, sparsely flowered. *Flowers* ± sessile or with pedicels to ca 3-4 mm long; bract single, ca 1.4-1.6 mm long, linear-lanceolate, bracteoles two, ca 1 mm long, lanceolate; sepals 5, somewhat united at the bases, rounded, ca 2.5-3 mm long and 1.3-1.5 mm wide; stamens 6-7, in one whorl, the filaments ca 1.5-2 mm long, widened at the bases, the anthers ca 0.8 mm long; ovary 5-7 carpellate, free, the styles ca 0.8 mm long, ± straight. *Fruit* a collection of 5-7 drupelets, each 2-3 mm long.

SOUTH AFRICA: Albert Dist., *Cooper 1358* (K); 8 mi from Greytown, *Wylie 28018* (MO); Somerset East, *MacOwen 1453* (F, NY); s. loc., *Cooper 366* (K, NY), *Ecklon & Zeyher s.n.* (MO).

Pollen grains prolate spheroidal, ca 26μ (E) × ca 27μ (P), colpi ca 17μ long, exine ca 2μ in thickness, sexine ± equal to nexine and sparsely small spinulose.

Pollen examined: *MacOwan 1453* (NY).

2. *Phytolacca acinosa* Roxb., Hort. Bengal. 35, 1814.

P. esculenta Van Houtte, Fl. Serres **4**: 398 B, 1848.
Pircuinia esculenta (Van Houtte) Moq., loc. cit. **9**: 236, 1853-54.
Phytolacca kaempferi A. Gray, Mem. Amer. Acad. n.s. **6**: 404, 1858. (Type *Small s.n.* GH)
P. pekinensis Hance, Jour. Bot. **7**: 166, 1869. (Type *Williams 12648*, location unknown)

Herbs, stout, ca 2-3 m. *Leaves* ovate, ovate-elliptic, or rarely ovate-lanceolate, acute to ± mucronate, entire, the bases attenuate to slightly rounded, up to 35 cm long and 16 cm wide, ± glabrous; petioles to 6 cm long. *Inflorescences* racemes, up to 30 cm long, mostly axillary, rarely terminal, the peduncle ± smooth to scurfy. *Flowers* with pedicels 5-13 mm long, slightly winged at the base in some; bract single, (1-)2-4 mm long, lanceolate to awl-shaped; bracteoles two, ca 1.5 mm long; sepals 5, ± unequal, 3-4 mm long and 1.8-2.3 mm wide, ovate to rounded; stamens 7-15, sometimes in ± two whorls, the filaments ca 1.8-2 mm long, widened at the bases, the anthers ca 0.8-1 mm long; ovary sessile or on short gynophore, ca 0.5 mm long, 6-9 carpellate, somewhat united at the base in flower,

mostly free in fruit, the styles ca 0.6-1 mm long, mostly straight, slightly recurved at the tip. *Fruit* an assemblage of drupelets, each up to 4 mm long.

Asia.

China: changyang: *Wilson 873a* (K). chihli: *Wang 20194* (NY). hupeh: *Chow* 532 (NY); *Henry 4351* (MO). kansu: *Potanin s.n.* (K). kiangsu: *Tsu 255* (K, MO). kwangtung: *Tso 20891* (NY). lungchow: *Morse 576* (NY). shantung: *Chiao 2609* (F). szechan: *Henry 5511A* (K). yunnan: *Forrest 5989* (K); *Henry 10705* (NY), *10705A* (MO). without province: *Henry 2045* (K); *Licent 1467* (K).

Japan: *Albrecht s.n.* (GH, NY); *Arimoto s.n.* (MO); *Dickens s.n.* (K, NY) *s.n.* (NY); *Higg s.n.* (NY); *Oldham 671* (GH, K); *Wright s.n.* (NY).

S. Korea: *Yongsok 8063* (F).

India: Assam: *Ward 8453* (K). himachal pradesh: *Gammie 18587* (K). kashmir: *Stewart 7873* (MO). punjab: *Jain & Bharadwaja s.n.* (NY). sikkim: *Watt 5709* (K). without province: *Griffith 4360* (K).

Pakistan: *Stewart s.n.* (NY).

Pollen grains subprolate, ca 23μ (E) $\times$ ca 28μ (P), colpi ca 23μ long, exine ca 2.5μ in thickness, sexine ca 2X as thick as nexine or $\pm$ equal to nexine and finely reticulated.

Pollen examined: *Henry 10705* (MO).

This Asian group of very robust herbs with conspicuously free-carpelled ovaries, is treated as an "aggregate species". Walter (1909) distinguished *P. acinosa* from *P. esculenta* primarily by the condition of the peduncle and inflorescence axis, scabrous in the former and glabrous in the latter, coloration of floral parts, and shape of sepals, all of which are not necessarily correlated in the manner described in his key. The individual characters, particularly coloration, are unsound bases for specific recognition.

Sect. 2 Pircunioides H. Walter, Pflanzenr. IV, 83 (Heft 39): 42, 1909.

3. *Phytolacca dodecandra* L'Her., Stirp. Nov. 143, *pl. 69*, 1789. (Type *Bruce s.n.* K)

P. abyssinica Hoffm., Comm. Götting. **12**: 27, 1796.
P. elongata Salisb., Prodr. 345, 1796.
P. lutea Marsigl. ex Steud., Nom. ed. 1, 618, 1821.
Pircunia abyssinica (Hoffm.) Moq. in DC., 13(2): 30, 1849.
Phytolacca scandens Hilsenb. & Boj. ex Moq., loc. cit., nom. nud. pro syn. *Pircunia abyssinica.*

Shrubs or herbs, dioecious, $\pm$ scandent. *Leaves* ovate or rarely ovate-lanceolate or $\pm$ deltoid, acute-mucronate to retuse-mucronate, entire, the bases rounded, oblique-rounded, or $\pm$ obtuse, up to 14 cm long and 8.5 cm wide; petioles up to 3.5 cm long. *Inflorescences* racemes, pistillate or staminate, up to 30 cm long, axillary or terminal, pubescent. *Staminate flowers* with pedicels ca 4-6 mm long; bract single, ca 1-1.2 mm long, very narrow; two bracteoles, ca 0.6 mm long, very narrow; sepals 5, $\pm$ equal, narrow-oblong, ca 2-2.3 mm long and 0.7-0.9 mm wide; stamens 13-15, in two whorls, the filaments ca 2.5 mm long, widened at the base, the anthers ca 1 mm long; ovary rudimentary, 3-5 carpellate. *Pistillate flowers* with pedicels 5-7 mm long at maturity; bract single, ca 1 mm long, awl-shaped; two bracteoles, ca 0.6-0.8 mm long, $\pm$ awl-shaped; sepals 5, $\pm$ equal, oblong-ovate, ca 2.5 mm long and 1.5 mm wide; stamens rudimentary, ca 8-12, deposited in two

(rarely one) whorls, the filaments ca 2 mm long, widened at the bases, the anthers ca 0.8 mm long; ovary 5 carpellate, ± free, the styles widened at the bases, the stigmas weakly penicellate. *Fruit* a collection of 5 or fewer drupelets, ca 3.5-4.5 mm long; seed 1, reniform, ca 3.5-4 mm long, testa shiny black.

Central and southern Africa and reported from Madagascar (Walter, 1909).

NIGERIA: Oban, *Talbot 1381* (MO).

REPUBLIC OF CONGO: Lake Kivu, *Linder 2032* (A); betw Sileko & Basoko, *Louis 11404* (MO); Yangambe, *Louis 264* (MO), *8638* (MO), *13890* (MO).

ETHIOPIA: s. loc., *Loccardo s.n.* (GH); *Schimper 131* (GH).

RUANDA: Biumba Terr, *Troupin 11819* (MO).

TANZANIA: Bezirk Bagamogo, *Schlieben 4136* (MO); N of Lake Nyasa, *Stolz 2265* (A).

UGANDA: s. loc., *Dummer 5405* (A).

RHODESIA: Headlands Dist, *Greenlow 88* (MO); Inyanga, *Whellan 672* (MO).

Pollen grains subprolate, ca 23μ (E) × ca 28-29μ (P), colpi ca 17-18μ long; exine ca 2μ in thickness, slightly thickened at the poles, sexine sparsely small spinulose.

Pollen examined: *Troupin 11819* (MO).

SUBG. 2 PIRCUNIOPSIS H. Walter Pflanzenr. IV, 83 (Heft 39): 45, 1909. (Type *P. dioica* L.)

SECT. 1 PIRCUNIOPHORUM H. Walter, loc. cit.

4. *Phytolacca sanguinea* H. Walter, Pflanzenr. IV, 83 (Heft 39): 46, 1909. (Lectotype selected: *Lehmann 4479* US, isolectotypes F, K. Syntypes: *Humboldt & Bonpland 822; Karsten s.n.; Linden 852;* all not seen)

Herbs, somewhat succulent, to 2 m. *Leaves* lanceolate-elliptic to elliptic to rarely ± ovate, acute, entire to very finely undulate, the bases obtuse to attenuate, up to 18 cm long and 6 cm wide, glabrous; subpetiolate to petioles ca 2.5 cm long. *Inflorescences* racemes, thyrsiform at the base, up to 15 cm long, the peduncle ⅓ to ½ this length, axillary or terminal, flowers crowded at maturity, scurfy. *Flowers* with pedicels to 1 cm long; bract single, ca 7-9 mm long, lanceolate; bracteoles two, sometimes appearing to be absent, ca 0.8-1 mm long, lanceolate; sepals 5, ± equal, oblong-elliptic, ca 4-5 mm long and 2-3 mm wide, ± red; stamens 8-11 (-15), deposited irregularly in one whorl, rarely two whorls, the filaments ca 2-2.5 mm long, the anthers ca 0.8-0.9 mm long; ovary ca 9 carpellate, almost completely united, the styles ca 1.5-2 mm long, recurved near the tip. *Fruit* a berry, ca 9 ribbed, black, ca 6 mm in diam.

Mostly northern South America.

COSTA RICA: *Hatheway 1358* (US).

COLOMBIA: CAUCA: El Tambo, *von Sneidern 1146* (F, NY, US); Popayan, *Lehmann 4479* (F, K, US); Mt Puracé, *Pennell & Killip 6510* (US); Quebrada del Río San Marcos, *Cuatrecasas 14776* (F, US). PUTUMAYO: Mts above Laguna de La Cocha, *Fosberg 20439* (NY, US); Valle de Sibundoy, *Cuatrecasas 11597* (F, US). SANTANDER: mts E of Las Vegas, *Killip & Smith 15783* (NY); Páramo Rico, *Killip & Smith 17703* (NY). TOLIMA: betw Cajamarca & summit of Divide, *Killip & Varela 34558* (US).

VENEZUELA: MÉRIDA: Páramo de las Lajas, *Hamburg-Tracy 141* (K).

Pollen grains prolate spheroidal, ca 25-26μ (E) × ca 28μ (P), colpi ca 22-23μ long, sexine ± equal to nexine and finely reticulated.

Pollen examined: *Killip & Smith 15783* (NY).

5. *Phytolacca rugosa* Br. & Bouche, Ind. Sem. Hort. Berol. 13, 1851. (Type *Warszewicz s.n.*, location unknown)

Herbs, woody at the bases, branches erect, angled, to 2 m. *Leaves* elliptic to elliptic-lanceolate, acute to long acuminate, entire, the bases attenuated or obtuse, up to 19 cm long and 6.5 cm wide; petioles to 5 cm long. *Inflorescences* racemes, to 15 cm long, mostly axillary. *Flowers* with pedicels, 3-7 mm long; bract single, ca 3-4 mm long, lanceolate; bracteoles two, < 1 mm long; sepals 5, ± equal, elliptic, 2-3 mm long, reflexed in fruit, white to pink; stamens 6-12, deposited on a hypogynous disc, the filaments ca 2 mm long, the anthers < 1 mm; carpels 4-9, united at the bases, styles not connivent and straight. *Fruit* a berry, sharply ridged, green-black, ca 6 mm in diam.

Mexico south to Colombia.

Mexico: guerrero: *Hinton 11082* (MO). jalisco: *Mexia 1661* (MO). michoacán: *Hinton 11896* (MO).

Costa Rica: *Dodge & Thomas 4351* (MO), *5320* (MO).

Panama: *Allen 311* (MO), *1511* (MO); *Blum et al. 2403* (MO); *Dwyer et al. 469* (MO); *Maurice 742* (MO); *Siebert 302* (MO); *Woodson & Schery 660* (MO); *Woodson et al. 884* (MO), *975* (MO).

Colombia: santa marta: *Smith 1160* (MO).

Pollen grains prolate, ca 24-26μ (E) × ca 34μ (P), colpi ca 24μ long, exine slightly thickened at the poles, sexine finely reticulated.

Pollen examined: *Hinton 11896* (MO).

6. *Phytolacca chilensis* (Miers ex Moq.) H. Walter, Pflanzeur. IV, 83 (Heft 39): 45, 1909, non H. Walter, loc. cit. 33.

P. chilensis Miers, Trav. **2**: 532, 1826, nom. nud.
Pircunia chilensis Miers ex Moq. in DC., Prodr. **13**(2): 29, 1849. (Type *Bridges s.n.* K)

Herbs, with woody bases. *Leaves* ovate-elliptic, mucronate, entire, the bases obtuse, up to 13 cm long and 5 cm wide; petioles to 3.5 cm long. *Inflorescences* spikes, to 20 cm long, axillary or terminal. *Flowers* sessile or with pedicels ca 1 mm long; bract single, ca 4-5 mm long, lanceolate; bracteoles two, ca 2 mm long, lanceolate; sepals 5, ± equal, ovate, rounded, ca 3-4 mm long and ca 2.5 mm wide; stamens 9-12, in 2 whorls, the filaments ca 2 mm long, the anthers ca 0.7 mm long; carpels 5-8, united only at the bases, the styles not connivent and straight. *Fruit* a weak berry, 5-8 ridged, ca 6-7 mm in diameter.

Chile: s. loc. *Bridges s.n.* (K).

No pollen examined due to paucity of flowering material.

Known only from the type collection, it nonetheless separates very easily from *P. sanguinea* and *P. rugosa* by its long spike. The possibility of hybrid origin from *P. icosandra* L. x *P. rugosa* (which could give the general characters of *P. chilensis*) are remote because of the geographical location. See also the discussion of *Anisomeria littoralis*.

Sect. 2 Pircuniopsis

sect. *Pseudolacca* Moq. in DC., Prodr. **13**(2): 30, 1849.

7. *Phytolacca tetramera* Hau. Mer., Apuntes Hist. Nat. **1**: 108, 1909. (Type *Hauman-Merck s.n.*, photo US, from B†)

Herbs, dioecious, to ca 0.5 m. *Leaves* spatulate to elongate lanceolate, mucronate, entire and finely undulate, the bases attenuate, up to 19 cm long and 5 cm wide, midrib prominent, up to 2 mm wide; subpetiolate to petioles 1-3 cm long. *Inflorescences* spikes, rarely spike-like racemes, staminate ca 4-5 cm long, the pistillate up to 10 cm long, mostly axillary. *Staminate flowers* sessile or with pedicels ca 2-3 mm long; bract single, present or absent, ca 2 mm long, closely appressed to sepals; bracteoles absent; sepals 4, unequal, ovate-elliptic, ca 2-2.5 mm long and 1.8-2.3 mm wide; stamens 12-15, irregularly deposited, the filaments ca 2.5-3.5 mm long, the anthers ca 1-1.5 mm long; ovary absent or of 2-3 carpels, thin and abortive. *Pistillate flowers* sessile or rarely with pedicels to 1 mm long; bract single, ca 2-2.5 mm long, sepal-like and keeled at the base, closely appressed to calyx; bracteoles absent; sepals 4, unequal, ovate, ca 2-2.5 mm long and 1.6-2.2 mm wide; stamens absent; ovary 6-9 carpellate, ± united, the styles somewhat connivent. *Berry* 6-9 ribbed, ca 4-6 mm in diam.

ARGENTINA: BUENOS AIRES: rd to Ignacio Correas, *Cabrera 5725* (NY); rd betw La Plata & Magdalena, *Cabrera 1641* (NY); Magdalena, *Parodi 6018* (GH); Monte Veloj, *Cabrera 626* (NY).

Pollen grains subprolate, ca 23μ (E) × ca 28-29μ (P), colpi ca 17-18μ long, sexine ± equal to nexine and finely reticulated.

Pollen examined: *Cabrera 626* (NY).

An easily identified species, not only because of the unique sepal number, but also because of the distinct leaf shape.

8. *Phytolacca dioica* L., Sp. Pl. ed. 2, 632, 1762. (Type *Alstroemer 129* LINN, not seen; from IDC Micro-Edition 607.5)

P. populifolia Salisb., Prodr. 345, 1796.
Pircunia dioica Moq. in DC., Prodr. **13**(2): 30, 1849.
Phytolacca arborea Moq., loc. cit., 31, nom. nud. pro syn *Pircunia dioica.*

Trees, dioecious, to 25 m. *Leaves* ovate, acute, entire to finely undulate, the bases rounded and sometimes decurrent, up to 12 cm long and 6 cm wide; petioles up to 7 cm long. *Inflorescences* racemes, up to 15 cm long, axillary or terminal. *Staminate flowers* with pedicels to 4 mm long; bract single, ca 1 mm long; bracteoles two, ca 1 mm long; sepals 5, ca 3 mm long; stamens 20-25, in two whorls, the filaments ca 4-5 mm long, the anthers ca 1.5-2 mm long; ovary occasionally present, 2-4 abortive carpels. *Pistillate flowers* with pedicels ca 3 mm long, ± stout; bract single, ca 0.5 mm long; bracteoles two, ca 0.5 mm long; sepals 5, ± equal, elliptic, ca 2-3 mm long, persistent in fruit; stamens ca 10, rudimentary; ovary 8-12 carpellate, incompletely united, the styles not connivent. *Fruit* a weak berry, ca 6-8 mm in diam.

South America.

ECUADOR: S Naranjapata, *Schimpff 534* (MO).
BRAZIL: PARANÁ: Desvio Ypiranga, *Dusen 16147* (MO, NY). SANTA CATARINA: Joinville, *Reitz & Klein 5701* NY); Vidal Ramos, *Klein 2222* (NY).
URUGUAY: Montevideo, *Herter 220* (MO).

Argentina: chaco: s. loc., *Jorgensen 1995* (MO); *Venturi 9825* (MO). corrientes: Santa Maria, *Pedersen 455* (MO, NY). misiones: Santo Pipo, *Schwarz 4844* (MO). tucumán: Quinta Lillo, *Descole-Borsini 35934* (NY).

Paraguay: guaira: Villarrico, *Jorgensen 3903* (MO). without province: *Hassler 447a* (MO, NY), *3379* (NY), *3380* (NY).

Pollen grains prolate, ca 17μ (E) $\times$ ca 25μ (P), colpi ca 17μ long, exine ca 2μ in thickness, sexine $\pm$ equal to nexine and finely reticulated.

Pollen examined: *Venturi 9825* (MO).

9. *Phytolacca weberbaueri* H. Walter, Pflanzenr. IV, 83 (Heft 39): 49, 1909. (Type *Weberbauer 4817*, photo F from B†).

Peru: cajamarca: vic of Casa Hacienda, *Hutchison & von Bismarck 6349* (F, MO, US).

Pollen grains prolate spheroidal, ca 21-22μ (E) $\times$ ca 24μ (P), colpi ca 17μ long, sexine $\pm$ equal to nexine and finely reticulated.

Pollen examined: *Hutchison & von Bismarck 6349* (MO).

The description is omitted because of a lack of female specimens.

Subg. 3 Phytolacca.

Subg. *Euphytolacca* Moq. in DC., Prodr. **13**(2): 31, 1849.

Sect. 1 Phytolacca.

Sect. *Phytolaccastrum* H. Walter, Pflanzenr. IV, 83, (Heft 39): 50, 1909.

10. *Phytolacca icosandra* L., Sp. Pl. 631, 1753. (Type LINN, not seen; from IDC Micro-Edition 607.4)

P. malabarica Crantz, Inst. **2**: 484, 1769.
P. mexicana Gaertn., Fruct. **1**: 377, *pl. 77, t. 8*, 1788, non Crantz (Inst. **2**: 484, 1769)
P. triquetra Moench, Meth. Suppl. 107, 1802.
P. mexicana Sweet, Hort. Brit. ed. 1: 337, 1827, non Crantz (Inst. **2**: 484, 1769)
P. sessiliflora Kunth & Bouche, Ind. Sem. Hort. Berol. 15, 1848.
P. acuminata Moq. in DC., Prodr. **13**(2): 33, 1849, nom. nud. pro syn. *P. icosandra*.
P. longespica Moq., loc. cit. (Type *Bates s.n.* P)
P. icosandra L. var. *fraseri* Moq. in DC., Prodr. **13**(2): 34, 1849. (Type *Fraser s.n.* G, not seen, in IDC Micro-Edition, Candolle Prodromi Herbarium)
P. nova-hispania Millsp., Publ. Field Mus. Nat. Hist., Bot. Ser. **2**: 41, 1900. (Type *Millspaugh 1413* F)
P. icosandra var. *angustitepala* H. Walter, Pflanzenr. IV, 83 (Heft 39): 61, 1909. (Type *Kerber 216a*, location unknown)
P. icosandra var. *sessiliflora* (Kunth & Bouche) H. Walter, loc. cit.

Herbs, sometimes woody at the bases, stems angled or grooved, to ca 2 m. *Leaves* variable, elliptic, to obovate or rarely lanceolate, acute, entire, the bases obtuse to attenuate, up to 16 cm long and 8 cm wide, $\pm$ glabrous, subsessile to petioles ca 4 cm long. *Inflorescences* spikes or spike-like racemes, up to 30 cm long, mostly axillary. *Flowers* mostly sessile or rarely with pedicels to 4 mm long; bract single, lanceolate, ca 4 mm long; bracteoles two, ca 1 mm long; sepals 5, $\pm$ equal, broadly elliptic to $\pm$ lanceolate, ca 3 mm long and ca 2 mm wide, persistent in fruit, pink tinged; stamens ca 8-20, usually in two whorls, on a hypogynous disc,

the filaments ca 2-2.5 mm long, widened at the bases, the anthers ca 1 mm long; ovary 6-9 carpellate, united, the styles connivent in flower and recurved. *Fruit* a berry, dark green to brown, rarely purple, ca 5-7 mm in diam.

Mexico, Central America, the West Indies and northern South America.

MEXICO: DURANGO: *Palmer 157* (MO). GUERRERO: *Hinton 9240* (MO). JALISCO: *Pringle 9525* (MO). MEXICO: *Ortenburger 16M650* (MO). MICHOACÁN: *Bro. Arsène 8703* (MO); *Hinton 12200* (MO), *12852* (MO); *Schery 124* (MO). NAYARIT: *Jones 23278* (MO). PUEBLA: *Pringle 6293* (MO). SINALOA: *Gentry 5911* (MO). SONORA: *Gentry 1423* (MO). VERA CRUZ: *Palmer 453* (MO).
COSTA RICA: *Godfrey 66075* (MO).
PANAMA: *Lewis et al. 321* (MO).
CUBA: *Wright 1392* (MO).
HAITI: *Holdridge 1630* (MO).
COLOMBIA: CAUCA: El Tambo, *Hultén 9* (GH).
VENEZUELA: MIRANDA: Los Mariches, *Pittier 11965* (MO).

Pollen grains prolate, ca 26μ (E) $\times$ ca 36μ (P), colpi ca 26μ long, exine ca 2μ in thickness, thickened at poles to ca 2.5μ, sexine $\pm$ equal to nexine and finely reticulated.

Pollen examined: Gentry *1423* (MO).

This is one of the more distinct species of *Phytolacca* perhaps best recognized by a combination of long inflorescences, almost sessile flowers and two staminal whorls, although any one of these three features alone is not sufficient.

11. *Phytolacca octandra* L. Sp. Pl. ed. 2, 631, 1763. (Type LINN, not seen; from IDC Micro-Edition 607.1)

P. mexicana Crantz, Inst. **2**: 484, 1796, non Gaertn. (Fruct. **1**: 377, *pl. 77, t. 8*, 1788) nec Sweet (Hort. Brit. ed. 1, 337, 1827)
P. decandra Descourt., Fl. Antill. **5**: 32, *pl. 312*, 1827, non L. (Sp. Pl. ed. 2: 631, 1763)
P. octandra var. *grandifolia* Moq. in DC., Prodr. **13**(2): 32, 1849. (Type *Galeotti 372* P)
P. acinosa Pope, Wayside Pl. Hawaii 61, *pl. 25*, 1929, non Roxb. (Hort. Bengal. 35, 1814).

Herbs, $\pm$ succulent, to 2 m. *Leaves* lanceolate, lanceolate-ovate, acute to acute-acuminate, sometimes mucronate, entire, the bases obtuse to attenuate, up to 22 cm long and 7.5 cm wide; subpetiolate to petioles ca 2.5 cm long. *Inflorescences* spikes or rarely spike-like racemes, up to 14 cm long, axillary or terminal, $\pm$ scurfy. *Flowers* sessile or with pedicels to 1 mm long; bract single, ca 2.2-2.5 mm long, lanceolate; bracteoles two, ca 1 mm long, narrow-lanceolate; sepals 5, subequal, oblong to ovate, ca 2-3 mm long and 1.2-2 mm wide; stamens 8-10, in one whorl, the filaments ca 1.5-1.8 mm long, the anthers $<$ 1 mm long; ovary 7-10 carpellate, united, the styles $\pm$ connivent. *Fruit* a berry, 7-10 ribbed, green-black, ca 4.5-6 mm in diam.

A $\pm$ cosmopolitan species.

MEXICO: FEDERAL DISTRICT: *Lyonnet 220* (K, MO). MORELOS: *Clark 7293* (MO). NUEVO LEÓN: *Kenoyer s.n.* (MO); *Meyer & Rogers 2738* (MO); *Taylor 195* (MO). SAN LUIS POTOSÍ: *Schaffner 887* (K). YUCATÁN: *Gaumer 674a* (MO). WITHOUT STATE: *Bourgeau 199* (K).
GUATEMALA: *Greenman & Greenman 5698* (MO).
COLOMBIA: NORTE DE SANTANDER: Mutiscua, *Killip & Smith 19651* (NY).
VENEZUELA: MÉRIDA: COLONIA TOVAR, *Fendler 1085* (MO, NY). Quebrada de Saisay, *Gehriger 26* (MO). MIRANDA: upper Pico de Naiguata, *Pittier 6272* (NY).
BOLIVIA: COCHABAMBA: Pocona, *Steinbach 8682* (K, MO, NY).
INDIA: Kodaikanal, *Matthew 1539* (K).

Java: preanger: *Schiffner 1932* (A).
Kenya: 18 mi S of Eldort, *Bogdan 1813* (K); Kakamega Forest, *Lucas 100* (K); Ngong Hills, *Kokwaro 312* (K); vic of Norfolk Hotel, *Kiwika 249* (K).
Rhodesia: Hondi View, *Noel 2341* (MO).
South Africa: Utrecht Natal, *Pole-Evans 3894* (K).
Australia: new south wales: *Constable 19105* (MO).
New Zealand: Rangitoto I, *Walker 4288* (MO).
Hawaii: oahu: *Degener 8892* (MO), *8893* (NY). Kauai: *Forbes 507* (K, MO).

Pollen grains prolate, ca 26μ (E) $\times$ ca 36μ (P), colpi ca 21-22μ long, exine ca 2.5μ in thickness and finely reticulated.

Pollen examined: *Gaumer 674a* (MO).

There are suggestions of characteristics of this species in many specimens; bona fide collections of *P. octandra* may be rather easily identified by the $\pm$ sessile flowers, inflorescences which are not conspicuously long (as in *P. icosandra* L.), and which have a relatively short peduncle and a single whorl of stamens.

12. *Phytolacca thyrsiflora* Fenzl ex J. A. Schmidt in Mart., Fl. Brazil. **14**(2): 343, *pl. 80,* 1872.

Herbs to 3 m. *Leaves* ovate-elliptic to elliptic, $\pm$ acute, entire or very finely undulate, the bases obtuse to attenuate, up to 14 cm long and 7 cm wide, glabrous; subpetiolate to petioles ca 3 cm long. *Inflorescences* raceme-like, thyrsiform near the base or often $\pm$ completely to tip, up to 30 cm long, axillary or terminal, the flowers not crowded at maturity, $\pm$ scurfy. *Flowers* with pedicels to 1.4 cm long; bract single, ca 2.5-4 mm long, lanceolate; bracteoles two, sometimes obsolete, ca 1.5-1.8 mm long, lanceolate; sepals 5, $\pm$ equal, oblong-ovate, ca 2-3 mm long and 1.5-2 mm wide; stamens 9-12, in one whorl, rarely a partial second whorl, the filaments ca 1.8-2 mm long, the anthers ca 0.8 mm long; ovary 7-9 carpellate and united. *Fruit* a berry, 7-9 ribbed, green to black, ca 5-7 mm in diam.

Brazil, French Guiana and Paraguay.

Brazil: espirito santo: Espirito Santo, *Robert s.n.* (K). goiás: S of Corumbá de Goiás, *Irwin et al. 10883* (MO); W of Veadeiros, *Irwin et al. 12793* (MO). maranhao: Maracassume River, *Froes 1997a* (K). minas geraes: betw Itamuri & Realeza, *Duarte & Castellanos 33176* (F); 4 km SE of Vicosa, *Irwin 2171* (US). pernambuco: Recife, *Tavares 985* (US). rio de janeiro: vic of Mangaratiba, *Monteiro 3107* (US); vic of Rio de Janeiro, *Glaziou 15354* (K). santa catarina: anitapolis: *Klein 435* (US); Brusque, *Smith 5800* (US); Caruru de Cacho, *Reitz 1889* (NY).
French Guiana: *Broadway 637* (US).
Paraguay: amambay: Sierra de Amambay, *Hassler 9909* (K, NY).

Pollen grains subprolate, ca 25μ (E) $\times$ ca 30μ (P), colpi ca 22-23μ long, sexine $\pm$ equal to nexine and finely reticulated.

Pollen examined: *Reitz 1889* (NY).

13. *Phytolacca heterotepala* H. Walter, Pflanzenr. IV, 83 (Heft 39): 51, 1909. (Syntypes: *Bourgeau 199* pro parte; *Ehrenberg s.n.; Hahn s.n.; Schiede s.n.; Schumann 1185* pro parte; all not seen).

Herbs to ca 2 m. *Leaves* $\pm$ lanceolate to ovate, acute to acute-mucronate, entire, the bases obtuse, up to 13 cm long and 6 cm wide; petioles up to 5 cm long. *Inflorescences* spike-like racemes, up to 25 cm long, mostly axillary, slightly scurfy.

Flowers with pedicels 1-4 mm long; bract single, ca 2.5-3 mm long, lanceolate; bracteoles two, ca 0.8-1 mm long, ± awl-shaped; sepals 5(-6-8), unequal, ± oblong, ca 3-4 mm long and 1.5-2.2 mm wide, stamens 15-22, in two whorls, the filaments ca 1.8 mm long, the anthers ca 0.9-1 mm long; ovary 8-9 carpellate and united. *Fruit* a berry, ca 8-9 ribbed, purple-black, ca 6-7 mm in diam.

Western United States and Mexico.

UNITED STATES: CALIFORNIA: Howell 34602 (US), 34604 (US), 35095 (US), 35121 (US). MEXICO: TAMAULIPAS: *Viereck* 333 (US).

Pollen grains subprolate, ca 28μ (E) × ca 35μ (P), colpi ca 24μ long, exine slightly thickend at the poles, sexine finely reticulated.

Pollen examined: *Howell 34602* (US).

The only collection listed in Walter's (1909) original description which I have seen is *Schumann 1185* (US), and I believe this to be *P. octandra* L. Nevertheless, the specimens from California possess the distinctive characters which Walter (1909) cited, i.e. unequal sepal size and two staminal whorls. Specimens collected by *Howell* in the vicinity of San Francisco, exhibit hybrid characters such as 8-9 sepals, sterility, and thyrsiform inflorescences, particularly *Howell 35122* (US), which because of the above anomalies, I do not cite (see Howell, 1960).

14. *Phytolacca meziana* H. Walter, Pflanzenr. IV, 83 (Heft 39): 57, 1909. (based on *P. icosandra* var. *octogyna*)

P. icosandra L. var. *octogyna* J. D. Smith, Bot. Gaz. **18:** 210, 1893. (Type *Heyde & Lux 3031* lectotype selected US).

Herbs, somewhat suffrutescent at the base. *Leaves* lanceolate-elliptic, acute, entire, the bases obtuse, up to 14 cm long and 4.5 cm wide, glabrous; petioles up to 5 cm long. *Inflorescences* racemes, up to 28 cm long, mostly axillary, ± scurfy. *Flowers* with pedicels to 1 cm long; bract single, ca 7-9 mm long, lanceolate; bracteoles two, ca 2 mm long, lanceolate; sepals 5, ± equal, oblanceolate to oblong, ca 4 mm long and 2 mm wide; stamens 15-20, in two whorls, the filaments ca 2-2.2 mm long, the anthers ca 0.9-1 mm long; ovary 7-8(-9) carpellate, united, the styles ca 1.5 mm long, slightly recurved at the tip, the stigma on the upper surface. *Fruit* a berry, 7-8 ribbed, black, ca 5-6 mm in diam.

Central America.

GUATEMALA: *Heyde & Lux 3031* (US).
COSTA RICA: *Standley 42697* (US).

Pollen grains subprolate, ca 24μ (E) × ca 30-31μ (P), colpi ca 19-21μ long, exine slightly thickened at the poles, sexine ± equal to nexine and finely reticulated.

Pollen examined: *Heyde & Lux 3031* (US).

15. *Phytolacca rivinoides* Kunth & Bouché, Ind. Sem. Hort. Berol. 15, 1848. (Type *Moritz s.n.*, location unknown)

P. icosandra Wright, Mem. 268, 1828, non L. (Sp. Pl. 631, 1753).
P. bogotensis Miq., Ser. Exot. *pl.* 6.3, 1842, non H.B.K. (Nov. Gen. Sp. Pl. **2:** 183, 1817).
P. macrostachya Willd. ex Moq. in DC. Prodr. **13**(2): 33, 1849, nom. nud. pro syn *P. icosandra.*
P. polystigma Benth. ex Moq., loc. cit.
P. polystyla Schomb. ex Moq., loc. cit., 460.

Herbs, succulent, robust, erect to 5 m. *Leaves* ovate-elliptic, rarely lanceolate, acute, acuminate, or rarely mucronate entire, the bases obtuse or rarely oblique, up to 21 cm long and 9 cm wide; petioles to 7 cm long. *Inflorescences* racemes, ca 40-50(-70) cm long, axillary or terminal, robust, the peduncle red-purple. *Flowers* with pedicels 7-13 mm long, filiform in some; bract single, ca 2 mm long, awl-shaped; bracteoles two, ca 0.5-0.7 mm long; sepals 5, ± equal, ovate, ca 2 mm long and 1.5 mm wide, white to pink, absent in fruit; stamens 10-17, in two whorls on a hypogynous disc, the filaments ca 1.5-2 mm long, the anthers ± globose, < 1 mm long; ovary 10-16 carpellate, united, the styles connivent at the base, free and recurved above. *Fruit* a berry, juicy, ribbed when dry, purple-black, 2-3 mm in diam and delicate appearing to 5-6 mm in diam and robust.

Mexico, south to Bolivia and Brazil, and the West Indies.

MEXICO: NUEVO LEÓN: *Frye & Frye 2548* (MO).
BRITISH HONDURAS: *Schipp 125* (MO).
HONDURAS: *Yuncker et al. 6166* (MO), *8459* (MO).
GUATEMALA: *Turckheim 11536* (MO).
COSTA RICA: *Dodge & Thomas 4367* (MO), *6406* (MO); *Godfrey 67290* (MO); *Rojas 205* (MO); *Skutch 2919* (MO), 3389 (MO).
PANAMA: *Blum 1259* (MO); *Duke 4351* (MO), *8104* (MO); *Ebinger 49* (MO); *Hunter & Allen 313* (MO); *Lewis et al. 874* (MO); *Tyson 2186* (MO), 3364 (MO); *Tyson et al. 2922* (MO); *von Wedel 833* (MO), *2078* (MO), *2079* (MO), *2631* (MO); *Woodson et al. 1392* (MO).
DOMINICAN REPUBLIC: *Valeur 11* (MO).
GUADELOUPE: *Duss 2400* (MO).
JAMAICA: *Hespenheide 709* (MO).
PUERTO RICO: *Otero 645* (MO); *Stimson 1684* (MO).
TRINIDAD: *Broadway 6778* (MO).
COLOMBIA: PUTUMAYO: Río San Miguel, *Schultes 3646* (MO). SANTA MARTA: s. loc., *Smith 1161* (MO), *2664* (MO). VALLE: Jamundi, *von Sneidern 4558* (MO).
VENEZUELA: MÉRIDA: Colonia Tovar, *Fendler 1084* (MO).
SURINAME: *Irwin et al. 55120* (MO).
GUYANA: *De La Cruz 2085* (MO), *2132* (MO), *3221* (MO), *3639* (MO), *4481* (MO).
BRAZIL: ACRE: NW of Cruzeiro do Sul, *Prance 2796* (MO.) AMAPA: vic of Mt Bruyers, *Irwin et al. 47328* (MO).
BOLIVIA: BENÍ: *Werdermann 2165* (MO). LA PAZ: S Yungas, *Krukoff 10300* (MO). NORDYUNGAS: nr Coroico, *Buchtien 4117* (MO). SANTA CRUZ: Río Víbora, *Steinbach 7574* (MO). WITHOUT PROVINCE: *Buchtien 5403* (MO).
PERU: CUZCO: Quincemil, *Vargas 7779* (MO). LORETO: vic of Pongo de Manseriche, *Mexia 6231* (MO); Boqueron Padre Abad, *Woytkowski 34358* (MO). PUNO: trail betw Santo Domingo & Machu, *Metcalf 30655* (MO). SAN MARTÍN: vic of Moyobamba, *Klug 3494* (MO).

Pollen grains subprolate, ca 27μ (E) × ca 35μ (P), colpi ca 22-23μ long, sexine ± equal to nexine and finely reticulated (Fig. 7).

Pollen examined: *Frye & Frye 2548* (MO).

An easily recognized species because of the very robust racemes, long pedicels and high carpel number.

16. *Phytolacca purpurascens* A. Br. & Bouche, Ind. Sem. Hort. Berol., app. 13, 1851. (Type *Warszewicz s.n.*, location unknown)

Herbs. *Leaves* elliptic, lanceolate-elliptic, or rarely ± ovate, acute or mucronate, entire, the bases obtuse, up to 22 cm long and 8 cm wide; petioles to 7 cm

long. *Inflorescences* spike-like racemes, up to 28 cm long, mostly axillary, lightly pubescent. *Flowers* with pedicels 3-6 mm long; bract single, ca 2.3-2.8 mm long, lanceolate; bracteoles two, ca 1.5-1.8 mm long, lanceolate; sepals 5, subequal, ± ovate, ca 2.5 mm long and 1.8-2 mm wide; stamens 13-17(-20), in two whorls, the filaments ca 1.5-1.7 mm long, the anthers ca 0.7-0.8 mm long; ovary (7-8-) 9-10 carpellate, ± completely united, the styles ± connivent. *Fruit* a berry, 7-10 ribbed, ca 6-7 mm in diam.

Sparsely distributed in the West Indies and reported from Central America (Walter, 1909).

HAITI: *Leonard & Leonard 11631* (MO, US), *13394* (US), *13912* (US), *15454* (US). GRAND BAHAMA I.: *Lewis 7166* (MO).

Pollen grains prolate spheroidal, ca 27μ (E) × ca 30μ (P), colpi ca 23μ long, sexine ± equal to nexine and finely reticulated.

Pollen examined: *Leonard & Leonard 13912* (US).

Phytolacca purpurascens is closely related to *P. icosandra* but can usually be distinguished from the latter by its longer pedicel, a somewhat unreliable character because of continuous graduation. This taxon may well be of hybrid origin from *P. icosandra* × *P. rivinoides* or *P. americana*.

17. *Phytolacca brachystachys* Moq. in DC., Prodr. **13**(2): 31, 1849. (Type *Beechey s.n.* K)

P. abyssinica Hook. & Arn., Bot. Beech. Voy. 94, 1832, non Hoffm. (Comm. Götting. **12**: 27, 1796).

P. bogotensis Mann, Proc. Amer. Acad. **7**: 198, 1867, non H.B.K. (Nov. Gen. Sp. Pl. **2**: 183, 1817).

Herbs. *Leaves* ± elliptic, acute or mucronate, entire, the bases obtuse, up to 17 cm long and 9 cm wide; petioles to 3.5 cm long. *Inflorescences* racemes, up to 16 cm long, mostly axillary, ± scurfy. *Flowers* with pedicels to 5 mm long; bract single, ca 2-2.5 mm long, lanceolate; bracteoles two, ca 1-1.5 mm long, lanceolate; sepals 5, ± equal, oblong, ca 3-4 mm long and ca 1.8-2 mm wide; stamens 7-9, in one whorl, the filaments ca 1.5 mm long, the anthers ca 0.8 mm long; ovary 5-7(-8) carpellate, united the styles connivent or sometimes free. *Fruit* a berry, 5-7 ribbed, ca 4-6 mm in diam.

HAWAII: *Degener 8891* (MO), *8896* (MO), *8897* (MO); *Degener & Wieblse 3302* (MO); *Forbes 184* (MO), *208* (MO), *1036* (F, MO); *Forbes & Rock s.n.* (MO); *Fosberg 10946* (F); *Heller 2772* (F, MO); *Mann & Brigham 426* (F, MO).

Pollen grains subprolate, ca 29μ (E) × ca 32μ (P), colpi ca 22-23μ long, exine ca 2.5μ in thickness, sexine ± equal to nexine and finely reticulated.

Pollen examined: *Heller 2772* (MO).

18. *Phytolacca bogotensis* H.B.K., Nov. Gen. Sp. Pl. **2**: 183, 1817.

P. australis Phil., Anal. Univ. Chil. **43**: 536, 1873. (Type *Philippi s.n.* photo NY, from B†)

P. micrantha H. Walter, Pflanzenr. IV, 83 (Heft 39): 57, 1909. (Type *Loretz & Hieronymus 947* B†)

P. parviflora Hau.-Mer., Apuntes Hist. Nat. **1**: 107, 1909. (Type *Hauman-Merck s.n.*, location unknown)

Herbs, ± succulent, to 2 m. *Leaves* lanceolate to elliptic, acute to ± acuminate, entire, the bases obtuse to attenuate, up to 18 cm long and 7 cm wide; subsessile to petioles ca 3.5 cm long. *Inflorescences* spike-like racemes, up to 20 cm long, axillary or terminal, scurfy. *Flowers* with pedicels ca 2-4 mm long; bract single, 2-3 mm long, lanceolate; bracteoles two, ca 1-1.2 mm long, narrow-lanceolate; sepals 5, subequal, oblong to ± ovate, ca 2-3 mm long and 1.2-2 mm wide; stamens 7-10, in one whorl, rarely a partial second whorl, the filaments ca 2 mm long, the anthers ca 0.8-0.9 mm long; ovary 7-10 carpellate, united, the styles thin. *Fruit* a berry, 7-10 ribbed, green-brown, ca 5-6 mm in diam.

South America.

Colombia: cauca: Popayan, *Lehmann 616* (GH).
Ecuador: E of Loja, *Espinosa 485* (NY); eastern Río Bamba, *Schimpff 791* (MO).
Chile: valdivia: S of José de La Mariquina, *Hollermayer 1205* (MO).
Bolivia: la paz: vic of Sorata, *Mandon 1030* (NY); *Williams 828* (K, NY). without province: Yungas Mts, *Scolnik & Luti 502* (NY).
Argentina: catamarca: s. loc., *Jorgensen 1490* (MO). jujuy: 25 km NW of Jujuy, *Eyerdam & Beetle 22227* (MO); Río Yala nr Yala, *West 6256* (MO). tucumán: Quebrada de Hules, *Venturi 9130* (MO).

Pollen grains prolate ca 25μ (E) × ca 34μ (P), colpi ca 23-24μ long, exine ca 2-2.5μ in thickness and finely reticulated.

Pollen examined: *Eyerdam & Beetle 22227* (MO).

Phytolacca bogotensis is very difficult to separate from *P. octandra*; the pedicel length, ± sessile in the latter species, appears to be the only consistent character.

19. *Phytolacca americana* L., Sp. Pl. 441, 1753.

P. decandra L., Sp. Pl. ed. 2, 631, 1763, non Descourt. (Flor. Med. Antilles **5**: *pl. 312*, 1827). (Type LINN, not seen; from IDC Micro-Edition 607.3)
P. vulgaris Crantz, Instit. **2**: 484, 1766.
P. rigida Small, Bull. N.Y. Bot. Gard. **3**: 422, 1904. (Type *Small & Wilson 1893* NY)

Herbs, ± succulent, to ca 3 m. *Leaves* lanceolate-elliptic, elliptic or rarely ± ovate, acute or sometimes mucronate, entire, the bases obtuse, up to 30 cm long and 12 cm wide (occasionally much larger); petioles to ca 6 cm long. *Inflorescences* racemes, sometimes thyrsiform at the bases, up to 30 cm long, mostly axillary, glabrous to lightly scurfy. *Flowers* with pedicels to 12 mm long; bract single, ca 2-3 mm long, lanceolate; bracteoles two, ca 1-1.5 mm long, lanceolate; sepals 5, ± equal ovate and rounded, ca 2.2 mm long and 2 mm wide; stamens ca 10, in one whorl, the filaments ca 2 mm long, the anthers ca 0.8 mm long; ovary ca 10 carpellate, united or sometimes the apices free, the styles mostly connivent in flower. *Fruit* a berry, ca 10 ribbed, ca 6-8 (-10) mm in diam.

Widely distributed in eastern North America and introduced into Europe, Africa and Asia; selected exsiccatae listed.

Canada: ontario: *Marie-Victorin et al. 56838* (MO); *Soper & Shields 377* (MO).
United States: florida: *Hitchcock 301* (NY); *Moldenke 250* (MO); *O'Neill s.n.* (MO); *Small & Small 4120* (NY), *4682* (NY), *5439* (NY); *Small & Wilson 2010* (NY); *Tracy 7531* (NY). indiana: *Deam 18* (MO). louisiana: *Ball 542* (MO). massachusetts: *Churchill s.n.* (MO); *Seymour 265* (MO). mississippi: *Pollard 1156* (MO). missouri: *Eggert s.n.* (MO); *Fritchey s.n.* (MO); *Kellogg 1713* (MO). oklahoma: *Houghton 3936* (MO). tennessee: *Ruth 191* (MO). west virginia: *Berkley 840* (MO). wisconsin: *Fassett 27388* (MO).

Pollen grains ca 25μ (E) × ca 34μ (P), colpi ca 23-24μ long, exine ca 2μ in thickness, slightly thickened at the poles to ca 2.5μ, sexine equal to or greater than nexine and finely reticulated.

Pollen examined: *Soper & Shields* 377 (MO).

Although *P. rigida* Small has been considered conspecific with *P. americana* by many authors, including Sauer (1952), there does seem to be a higher frequency of certain characteristics in specimens from Florida, the type locality for *P. rigida.* These features include a shorter raceme, hence the specific epithet which refers to the erectness of the inflorescence, and pedicels which are, on the average, a little shorter and stouter than for most individuals of *P. americana.* Hardin (1964) in a study of the two taxa cited the above observation plus minor differences in leaves, bracteole width, number of fruits, etc., all of which, as his Table 1 (p. 163) indicates, have overlapping measurements. The most striking discovery was the difference in the xylem of the peduncle, in which *P. rigida* averages a 70% thicker cylinder. In spite of Hardin's results, and he makes no definite designation of the status of the Florida collections, I tend to favor a reduction of *P. rigida* to *P. americana* in view of the widespread morphological variation in the entire genus. Hardin's tentative conclusions and ideas are worthy of mention because of their applicability to the problem of speciation in *Phytolacca* in general (Hardin, 1964, p. 162): "*P. rigida* may represent an ecological variant of *P. americana* which is not yet distinct; i.e., an early stage in sympatric speciation. On the other hand, two distinct species may have existed at one time and with forced migration and sympatry during Pleistocene or before, the old barriers and discontinuities have been eliminated. A third possibility is that *P. americana* has been "contaminated" by introgression from a tropical or subtropical species such as *P. octandra* which has an erect raceme, by way of Mexico or the Caribbean."

SECT. 2 PHYTOLACCOIDES H. Walter, Pflanzenr. IV, 83 (Heft 39): 61, 1909.

20. *Phytolacca pruinosa* Fenzl., Del. Sem. Hort. Vindob 8, 1855. (Type *Kotschy s.n.* W, not seen)

Herbs, dioecious, stems ± succulent, mostly unbranched, to 1 m. *Leaves* ovate-lanceolate, acute, rarely mucronate, entire, the bases obtuse-attenuate, up to 10 cm long and 4 cm wide; petioles indistinct. *Inflorescences* racemes, the staminate up to 12 cm long, the pistillate up to 7 cm long and densely flowered. *Staminate flowers* with pedicels up to 6 mm long; bract single, ca 2.5-3 mm long, lanceolate; bracteoles two, ca 1 mm long, located ca midway on pedicel; sepals 5, ± equal, ovate ca 3.5-4 mm long and ca. 2.5 mm wide, green to pink; stamens 15-20, in two whorls, the filaments ca 2-2.5 mm long, widened at the base, the anthers ca 1-1.2 mm long; ovary rudimentary, 5-7 carpellate. *Pistillate flowers* with pedicels up to 3.5 mm long; single bract, ca 2.2-3 mm long; two bracteoles, ca 1.8-2 mm long; sepals 5, ± equal, ovate-triangular, ca 3-3.5 mm long and 2.5-3 mm wide, green to pink; stamens rudimentary and much reduced, 12-15, appear-

ing to be deposited in two whorls; ovary 6-9 carpellate, united, the styles recurved. *Fruit* a berry, 6-9 ribbed, ca 5-6 mm in diam; seeds reniform, ca 3.5 mm long.

Endemic to Cyprus.

Cyprus: *Haradjian 487* (MO); *Oswald 147* (K); *Young 7808* (K).

Pollen grains ca 27μ (E) × ca 34μ (P), colpi 20-23μ long, exine slightly thickened at the poles, sexine medium finely reticulated.

Pollen examined: *Young 7808* (K).

Excluded Specimens:

Horticultural specimens from Kew, the type collections of P. clavigera W. W. Smith (Bot. Mag. ***149:*** *pl. 8978, 1923).* At first glance this specimen appears to be the robust Asian species, *P. acinosa;* however, the carpels are definitely united. Since it is of horticultural origin, I hesitate to treat it as a distinct species until I have seen more collections.

Pittier 6272 (US). This is the type collection of *P. venezuelensis* O. C. Schmidt (Notizbl. Ber. **8:** 312, 1923), which in my opinion is a stunted specimen of *P. octandra.* The carpel connation is not characteristic of subg. *Pircuniopsis,* to which Schmidt assigned it.

RIVINOIDEAE

II. Subf. **Rivinoideae** Nowicke, subf. nov. Ovarium unicarpellatum et uniovulatum; achenium, drupa, samara, vel utriculus. (Type *Rivina* L.)

A. Tribe **Seguierieae** Nowicke, trib. nov. Inflorescentiae paniculiformes; samara. (Type *Seguieria* Loefl.)

a. Calyx of 4 sepals, becoming woody and remaining erect in fruit .....4. *Gallesia*
aa. Calyx of 5 sepals, herbaceous and becoming reflexed in fruit .....5. *Seguieria*

4. GALLESIA

Gallesia Casar., Stirp. Bras. Dec. **5:** 43, 1843.

Monotypic.

1. *Gallesia integrifolia* (Spreng.) Harms in Engler & Prantl, Nat. Pflanzenfam. **2**(16): 144, 1934. (Neotype selected: *Ducke 24211* US, isoneotypes G, S)

Thouinia integrifolia Spreng., Neue Entdeck. **2:** 155, 1821.
Crataeva gorarema Vell., Fl. Flum. **1:** 191; **5:** *pl. 4,* 1825.
Gallesia scorododendrum Casar., Nov. Stirp. Bras. Dec. **5:** 44, 1843.
G. gorazema (Vell.) Moq. in DC., Prodr. **13**(2): 8, 1849. (Type *Vauthier 146* G, P)

Trees to 30 m. *Leaves* ovate to ovate-elliptic, acute to acuminate, entire, the bases obtuse or slightly cordate, up to 12 cm long and 6.5 cm wide, glabrous, ± leathery; petioles ca 2-3 cm long. *Inflorescences* irregular panicles, ca 10-20 cm long, axillary or terminal, softly pubescent. *Flowers* perfect, ± actinomorphic, ± sessile; bract single, ca 1.2 mm long; bracteoles two, ca 1.2 mm long; sepals 4, somewhat unequal, ovate, ca 4 mm long and 1.4-2.5 mm wide, green-brown, leathery, pubescent, thickened at the base, erect in fruit and becoming enlarged and the margins split; stamens numerous, irregularly deposited, the filaments ca

1.5 mm long, the anthers ca 1.5 mm long; ovary 1-carpellate, compressed laterally, the style flattened, the stigma papillose on one edge. *Fruit* a samara, ca 2.5-3 cm long, brown, the non-stigmatic edge gradually curved or ± constricted at the base; seed one, ovoid to elliptic, compressed laterally.

Central South America: Bolivia, Brazil, Ecuador and Peru.

Pollen grains single, subprolate, ca 21-22μ (E) × ca 24-25μ (P), 3-colporoidate, colpi ca 9-10μ long, os irregular, ca 4μ wide and ± as long as colpi, exine ca 1.7μ in thickness, ca 2μ at the poles, sexine ± equal to nexine and ± smooth.

Although clearly related to the large genus *Seguieria* Loefl. by its almost identical flower plan and samara fruit, *Gallesia* is nevertheless easily identifiable by its 4-merous calyx, which has a woody texture and remains erect in fruit. *Gallesia ovata* O.C. Schmidt is here reduced to a variety of *G. integrifolia* (Spreng.) Harms for the following reasons: while there appears to be some variation in the shape of the samara wing, the condition is somewhat indeterminate, and the wider leaves cited for *G. ovata* do not constitute a distinguishing character.

a. Samara wing with gradual taper .....1a. *G. integrifolia* var. *integrifolia*
aa. Samara wing with a constricted basal portion .....1b. *G. integrifolia* var. *ovata*

1a. *Gallesia integrifolia* (Spreng.) Harms var. *integrifolia*.

BOLIVIA: LA PAZ: San Bartolomé, *Krukoff 10118* (G, S, US).

BRAZIL: ACRE: upper Rio Jurupary, *Krukoff 5216* (G, S, US); Seringal, *Ducke 24212* (S, US). AMAZONAS: Rio Purus, *Ducke 24211* (G, S, US). BAHIA: basin of Rio Grongogy, *Curran 7* (US). MATO GROSSO: Recreio, *Lutz 1427* (US). MINAS GERAES: Caldas, *Regnell III 1014* (S, US). PARANÁ: Patrimonio, *Dusen 16786* (S). RIO DE JANEIRO: Copacabana, *Glaziou 4753* (S).

ECUADOR: EL ORO: vic of Piedras, *Little 6621* (US).

PERU: JUNIN: *Satipo, Vasquez 16* (G).

Pollen examined: *Ducke 24211* (US).

1b. *Gallesia integrifolia* (Spreng.) Harms var. **ovata** (O.C. Schmidt) Nowicke, stat. nov.

G. ovata O. C. Schmidt, Repert. Sp. Nov. **32**: 97, 1933. (Type *Raimondi 11606* B†)

BRAZIL: ACRE: nr mouth of Rio Macauhan, *Krukoff 5405* (G, S, US).

The *Krukoff* collection is cited by Macbride in the Flora of Peru (1936) as *Gallesia integrifolia* even though he recognizes both "species." It differs, however, from all other collections of *Gallesia* in the constriction of the samara wing near the base.

5. SEGUIERIA

Seguieria Loefl., Iter Hispan. 191, 1758. (Type *S. americana* L.)

Seguiera Adans., Fam. Pl. **2**: 443, 1763.

Albertokuntzea O. Ktze., Rev. Gen. Pl. **2**: 550, 1891.

Trees, shrubs, or lianas. *Leaves* lanceolate, lanceolate-elliptic to ovate, acute to mucronulate, entire, the bases obtuse to slightly rounded, papery to ± leathery, mostly glabrous; petiolate or subpetiolate; stipular thorns present or absent on flowering branches, sometimes conspicuous on older branches. *Inflorescences* irregular panicles, rarely ± racemes, axillary or terminal, mostly pubescent. *Flowers* perfect, ± actinomorphic, pedicellate; bract single, awl-shaped, sometimes keeled

at the base; bracteoles two, or rarely absent, mostly awl-shaped; sepals 5, ± equal, oblong to oblanceolate, somewhat veined, reflexed in fruit; stamens ∞, generally in 2-3 irregular whorls, the filaments ± filiform, the anthers linear; ovary 1-carpellate, compressed laterally, the styles flattened, the stigma lightly papillose on one edge. *Fruit* a samara, the base or ovary with or without a tubercle and ridges or winglets, green to black on drying, the stigmatic edge convex, straight, or concave; seed one, ovoid (Fig. 2).

South America.

Pollen grains single, prolate, ca 15-22μ (E) × ca 25-30μ (P), 3-colpate, colpi ca 18-25μ long, exine ca 1.5-2μ in thickness, sexine ± equal to nexine and almost smooth.

In 1909 Walter described the genus *Seguieria* with 23 species in two sections. The sect. 1 *Euseguieria* H. Walter, is characterized by a small tubercle and ridges at the base of the samara and includes 13 species. The sect. 2 *Seguieriella* H. Walter has samaras lacking the above characters and includes the remaining species. Specific alignments within the sections are very difficult and the flowers, and in most instances the fruits, do not yield good distinctive characters. My treatment of the genus is admittedly based on insufficient material, even though all

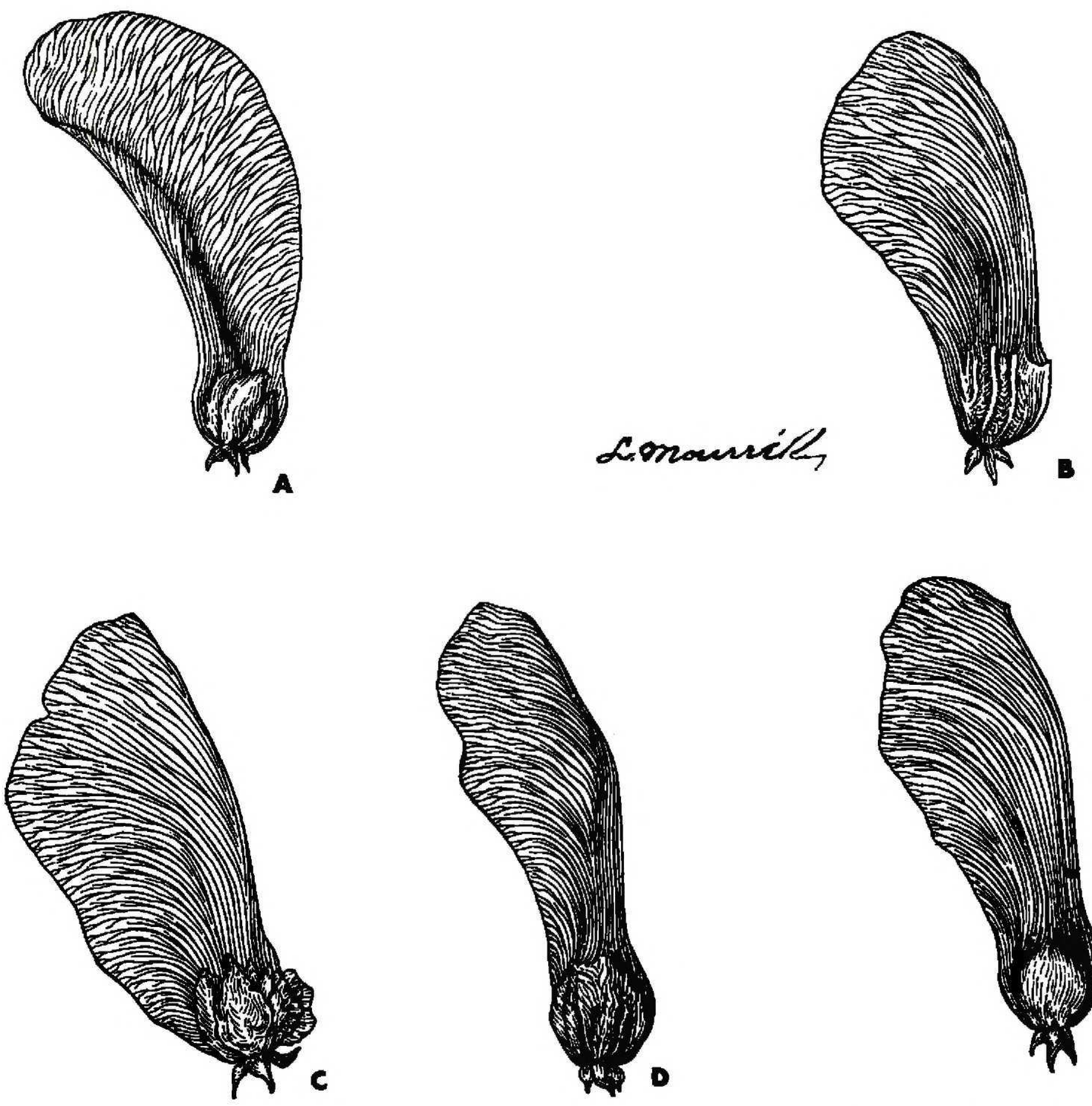

Fig. 2. *Seguieria* L. samara types. A, *S. coriacea* Benth.; B, *S. foliosa* Benth.; C, *S. vauthieri* Moq; D, *S. floribunda* Benth.; E, *S. parvifolia* Benth. A after *Regnell III 1013* (US); B after *Schomburgk 661* (K); C after *Vauthier 29* (K); D after *Gardner 722* (US); E after *Schwarz 4256* (MO).

loans from the world's major herbaria included a request for specimens. In view of Walter's high number of species, I think two conclusions are possible; firstly, that the group has not been well collected and distributed, or secondly, that as so many species are based on only one collection, they may represent extreme forms of polymorphic species. Undoubtedly both factors plus the lack of fruiting material have contributed to great difficulty with the genus. It is badly in need of monographic revision.

The original treatment of sect. 1 was severely limited by lack of material for many of the species which Walter authored. However, after an examination of type material at Kew and subsequent borrowing of many of these collections, I have recognized and described nine of the 13 species and transferred one, *S. brevithyrsa* H. Walter, to sect. 2. To my knowledge, I have not seen specimens of *S. inermis* H. Walter and *S. wangerinii* H. Walter and omit their treatment; and based on a photo of the type, *S. pachycarpa* H. Walter has been reduced to *S. foliosa* Benth. Even though most descriptions are from type material, I wish to emphasize that the entire treatment of the section is highly provisional due to lack of additional collections to reinforce the validity of species.

The sect. 2 *Seguieriella*, which included 10 species according to Walter (1909), is here reduced to six or possibly seven species, not including the transfer of *S. brevithyrsa*. *Seguieria paraguayensis* Morong, *S. macrophylla* Benth. and *S. glaziovii* Briq. are all rather distinct species. *Seguieria affinis* Heimerl (including *S. rigida* H. Walter) is very close to *S. glaziovii* and may prove to be conspecific; the former has very long stipules on the older stems, a character not specifically listed for *S. glaziovii*, which may be lacking on the latter specimens due simply to poor collecting techniques. Two wide ranging and very variable species, *S. parvifolia* Benth [including *S. votschii* H. Walter and *S. guaranitica* Speg.; the latter reduction agrees with Heimerl (1934)] and *S. americana* are very difficult to define, and the determiner must almost resort to utilizing these two complexes as "catch-alls" for specimens which are not readily identifiable as one of the more distinct species. Even so, I think in most instances the specimens would be correctly classified. *Seguieria mammifera* H. Walter is not treated due to lack of material. The photo of the type (*Riedel s.n.*) does very little to elucidate the species characteristics.

Following the Code, the sect. *Seguieriella*, which contains the type *S. americana*, must become sect. *Seguieria*, and sect. *Euseguieria* I have renamed sect. *Walteria*.

a. Samaras with ridges or winglets and/or a tubercle at the base ..... Sect. 1. *Walteria*
  b. Leaves leathery.
    c. Leaves ± lanceolate, or if lanceolate-elliptic then at least some 10 cm long.
      d. Leaves crowded, the largest < 10 cm long; inflorescences mostly axillary and < 10 cm long .....1. *S. langsdorffii*
      dd. Leaves not crowded, at least some > 10 cm long; inflorescences mostly > 10 cm long and axillary or terminal .....2. *S. longifolia*
    cc. Leaves ± ovate, elliptic-ovate, or if rarely elliptic-lanceolate then < 10 cm long.
      e. The stigmatic edge of the samara wing convex, or if not distinctly so, then with the non-stigmatic edge arising from the base of the ovary.

f. Non-stigmatic edge of samara wing constricted near the top of the ovary, and wings < 15 mm at its widest point .....3. *S. floribunda*
ff. Non-stigmatic edge of samara wing arising conspicuously from the base of the ovary, at least some wings 16-20 mm at widest point .....4. *S. vauthieri*
ee. The stigmatic edge ± straight or concave, the non-stigmatic edge not noticeably arising from the base of the ovary .....5. *S. coriacea*
bb. Leaves not distinctly leathery.
g. At least some leaves with retuse tips.
h. Stipules small, < 2 mm long, straight; leaves ovate to ovate-rounded, the bases rounded .....6. *S. alberti*
hh. Stipules 2-3 mm long, recurved; leaves ovate-elliptic to ovate, the bases obtuse .....7. *S. emarginata*
gg. Leaves without retuse tips.
i. Leaves lanceolate-elliptic to ovate-lanceolate, at least some 10-11 cm long; flowering branches without stipules; inflorescences mostly terminal .....8. *S. laurifolia*
ii. Leaves ovate, the largest < 10 cm long; flowering branches with recurved stipules; inflorescences mostly axillary .....9. *S. foliosa*
aa. Samaras without protuberances at the base .....Sect. 2 *Seguieria*
e. Bracteoles absent; leaves ovate to ± rounded, pale green on drying .....10. *S. paraguayensis*
ee. Without the above combination of characters.
f. Leaves ± lanceolate-elliptic, conspicuously mucronate.
g. Samaras black on drying, the stigmatic edge ± straight, a small protuberance near the distal end .....11. *S. glaziovii*
gg. Samaras brown on drying, the stigmatic edge convex and gradually tapering at the distal portion .....12. *S. affinis*
ff. Leaves not lanceolate and not conspicuously mucronate.
h. Climbers; leaves ovate to ± elliptic, the stipules thick and recurved; samaras black or dark brown on drying, distal protuberance on wing absent.
i. Leaves large, ovate, the bases ± rounded; samaras brown on drying .....13. *S. macrophylla*
ii. Leaves smaller, ± elliptic, the bases ± obtuse; samaras black on drying .....14. *S. brevithyrsa*
hh. Without the above combination of characters.
j. Samara wing with protuberance; leaves generally elliptic or ovate-elliptic, the stipules ± straight; widespread. .....15. *S. parvifolia*
jj. Samara wing without protuberance; leaves more ovate, or ovate-rounded, the stipules recurved; mostly from Colombia ....16. *S. americana*

Sect. 1 **Walteria** Nowicke, nom. nov. (Type selected: *S. floribunda Benth.*)

sect. *Euseguieria* H. Walter, Pflanzenr. IV 83 (Heft 39): 87, 1909.

1. *Seguieria langsdorffii* Moq. in DC., Prodr. **13**(2): 6, 1849. (Type *Langsdorff s.n.* G, K)

Albertokuntzea langsdorffii (Moq.) O. Ktze., Rev. Gen. Pl. **2**: 550, 1891.

Trees to ca 15 m. *Leaves* crowded, lanceolate or lanceolate-elliptic, acute to mucronate, entire, the bases obtuse or attenuate, up to 10 cm long and 4 cm wide, ± leathery; petioles to ca 1 cm long; stipules to 5 mm long, erect, slender. *Inflorescences* ± racemes or weak panicles, up to 10 cm long, mostly axillary, sparsely pubescent. *Flowers* with pedicels to 5 mm long; bract single, ca 1-1.5 mm long, awl-shaped and keeled at the base; bracteoles two or none, ca 0.5 mm long; sepals

oblong, ca 2.5-3 mm long and 1.8-2.3 mm wide; filaments ca 2 mm long, the anthers ca 1.5-1.8 mm long. *Samara* unknown.

BRAZIL: BRASILIA: s. loc., *Riedel s.n.* (GH). MINAS GERAES: s. loc., *Langsdorff s.n.* (K). RIO DE JANIERO: vic of Rio de Janeiro, *Glaziou 8259,* (K); s. loc., *Filho 98* (F, MO). WITHOUT STATE: *Gardner s.n.* (BM).

Pollen grains ca 15μ (E) × ca 25μ (P), colpi ca 18-19μ long.

Pollen examined: *Riedel s.n.* (GH).

2. *Seguieria longifolia* Benth., Trans. Linn. Soc. London **18:** 235, 1839. (Type *Pohl s.n.* K)

Albertokuntzea longifolia (Benth.) O. Ktze., Rev. Gen. Pl. **2:** 550, 1891.

Trees or shrubs? *Leaves* lanceolate to lanceolate-elliptic, acute, entire, the bases obtuse to slightly rounded, up to 13 cm long and 4 cm wide, ± leathery; petioles ca 4-7 mm long, stipules small, ca 1-2 mm on flowering branches and recurved. *Inflorescences* panicles, irregular, up to 17 cm long, axillary or terminal, sparsely to densely villous. *Flowers* with pedicels to 5 mm long; bract single, ca 0.5-0.7 mm long, awl-shaped; bracteoles two, ca 0.5 mm long, awl-shaped; sepals oblong, ca 3-4 mm long and 1.5-2.5 mm wide; filaments ca 2 mm long, the anthers ca 1.5-1.8 mm long; ovary with winged and/or ridged base. *Samara* unknown.

BRAZIL: BRASILIA: Mathea barboso, *Pohl s.n.* (K). WITHOUT STATE: *Pohl 3747* (F); *Sello s.n.* (K).

No pollen examined due to lack of suitable flowering material.

The specimens cited have minor variation in their leaf shape, i.e. the tip and the base. While I include the *Sello* collection with some reservation, I believe this to be the best decision until further collections are observed.

3. *Seguieria floribunda* Benth., Trans, Linn. Soc. London **18:** 235, 1839. (Type *Gardner* 722 BM, F, K, P, US)

Albertokuntzea floribunda (Benth.) O. Ktze., Rev. Gen. Pl. **2:** 550, 1891.

Shrubs or woody vines. *Leaves* elliptic-ovate to elliptic-lanceolate, acute, entire, the bases obtuse, up to 10 cm long and 6 cm wide; petioles ca 2-4 mm long; stipules 0.5-4 mm long, recurved. *Inflorescences* panicles, irregular, ca 18-22 cm long, axillary or terminal, pubescent. *Flowers* with pedicels to 6 mm long; bract single, < 1 mm long, awl-shaped; bracteoles two, < 1 mm long, awl-shaped; sepals oblong, ca 4.5-6 mm long and 2-3 mm wide; filaments ca 1.5-1.8 mm long, the anthers ca 1.5-1.8 mm long. *Samara* ca 3.5-4 cm long, brown, the base with prominent winglets, the stigmatic edge convex (Fig. 2D).

Brazil and Peru.

BRAZIL: MINAS GERAES: s. loc., *Regnell III 1013* (US, in 1845). WITHOUT STATE: *Gardner* 722 (BM, F, K, P, US).

PERU: MADRE DE DIOS: Río Acre, *Ule 9487* (K, US).

No pollen examined due to lack of suitable flowering material.

The *Ule* specimens with the numbers *9487* and *9486* on the same sheet (K) are cited by Macbride in the Flora of Peru (1936) as *S. foliosa* Benth. I have seen the types of both species, and while the *Ule* collections are not identical to either, they are much closer to *S. floribunda* than to *S. foliosa.*

4. *Seguieria vauthieri* Moq. in DC., Prodr. **13**(2): 7, 1849. (Type *Vauthier* 29 K)

Albertokuntzea vauthieri (Moq.) O. Ktze., Rev. Gen. Pl. **2**: 550, 1891.

Trees or shrubs? *Leaves* ovate, obtuse, entire and slightly inrolled, the bases obtuse, up to 3 cm long and 4 cm wide, somewhat leathery; petioles ca 3-4 mm long, the stipules very small, ca 1 mm long or absent. *Inflorescences* panicles, weakly so, ca 13 cm long, terminal, ± glabrous. *Flowers* with pedicels to ca 7 mm long; bract single, ca 1 mm long; bracteoles two, ca 0.8-1 mm long; sepals and stamens unknown. *Samara* ca 3.5-4 cm long and 1.6-2 cm wide, brown, the stigmatic edge ± convex, the non-stigmatic edge arising from the base of the ovary (Fig. 2C).

Known only from a single fruiting collection.

Brazil: Brasilia, *Vauthier 29* (K).

No pollen examined due to lack of suitable flowering material.

Walters (1909) concept of this species is erroneous. His description is based solely on one of the confusing *Regnell III 1013* collections (1864) of which there appear to be three, all collected on different dates, 1845, 1855 and 1864. The 1864 collection bears Walter's determination as well as the location of Caldas. This specimen differs markedly in samaral characters from that of *Vauthier 29* (K), the type collection of *S. vauthieri.* I have included *Regnell III 1013* (1864 & 1855), as well as an unnumbered *Regnell* collection from 1866, under *S. coriacea* Benth. because of their similarity in leaf shape, stipule size and direction, and inflorescence size and position, to that of the type for this species, *Blanchet 2908.*

5. *Seguieria coriacea* Benth., Trans. Linn. Soc. London **18**: 235, 1839. (Type *Blanchet 2908* BM; photo F, from G)

Albertokuntzea coriacea (Benth.) O. Ktze., Rev. Gen. Pl. **2**: 550, 1891.

Shrubs or small trees. *Leaves* elliptic-lanceolate, acute to slightly mucronulate, entire, the bases obtuse, up to 8 cm long and 3.5 cm wide, ± leathery; petioles ca 3-5 mm long; stipules up to 13 mm long, ± straight to slightly recurved. *Inflorescences* panicles, irregular, up to 40 cm long, axillary or terminal, lightly pubescent, ± woody. *Flowers* with pedicels to 6 mm long; bract single, ca 1 mm long, awl-shaped; bracteoles two, ca 0.8 mm long, awl-shaped; sepals oblanceolate, up to 4 mm long and 2-2.6 mm wide; filaments ca 1.8-2 mm long, the anthers ca 1.5 mm long. *Samara* ca 3.5-4 cm long and ca 1.7 cm wide, brown-green, the base with prominent winglets, the stigmatic edge concave (Fig. 2A).

Brazil: bahia: Acurua, *Blanchet 2908* (BM; photo F, from G). minas geraes: s. loc., *Regnell III 1013* (K, in 1855; US, in 1864), *s.n.* (US, in 1866).

Pollen grains ca 18μ (E) × ca 27μ (P), colpi ca 19μ long.

Pollen examined: *Regnell 1013* (K).

The specific epithet which Bentham (1839) applied to this species is perplexing with regard to the BM collection of *Gardner 2908.* Of the six species which he described, this specimen has perhaps the least coriaceous leaves. A photo (F from G) of a more mature portion of the type does appear to have the coriaceous leaves characteristic of the *Regnell* collections. For the present I am assuming, based on

Bentham's description of the leaves (Bentham, 1839, p. 235) "foliis subsessilibus oblongis obtusissimis coriaceis" and choice of names in light of the remaining collections on which he based five other species, that he saw extensive material of *Gardner 2908* and that the BM specimen represents an immature leaf stage. See also the discussion of *S. vauthieri.*

6. *Seguieria alberti* H. Walter, Repert. Sp. Nov. **8:** 79, 1910. (based on *S. elliptica*)
S. elliptica H. Walter, Pflanzenr. IV, 83 (Heft 39): 89, 1909, non Fries (Ark. Bot. Stockh. **8:** 20, 1909). (Type *Glaziou 8260* K)

Trees or shrubs? *Leaves* ovate to ovate-orbicular, entire, obtuse and ± retuse, the bases rounded or slightly obtuse in immature leaves, up to 6 cm long and 3.5 cm wide; petioles ca 3-6 mm long, stipules on flowering branches ca 2 mm long, horizontal to ± ascending. *Inflorescences* panicles, irregular, axillary or terminal, up to 10 cm long, ± villous. *Flowers* with pedicels to 5 mm long; bract single, ca 1 mm long, awl-shaped; bracteoles two, ca 1 mm long, awl-shaped; sepals oblong, ca 4-5 mm long and 2-2.5 mm wide; filaments 2.5-3 mm long, the anthers ca 1-1.2 mm long; ovary with ridges in mature flowers. *Samara* unknown.

BRAZIL: RIO DE JANEIRO, vic of Rio de Janeiro, *Glaziou 8260* (K, photos F, from B & G).
No pollen examined due to paucity of flowering material.

7. *Seguieria emarginata* H. Walter, Pflanzenr. IV, 83 (Heft 39): 89, 1909. (Type *Glaziou 5730* K)

Trees or shrubs? *Leaves* ovate-elliptic to ovate, entire, blunt-acute and retuse, the bases obtuse, up to 8 cm long and 5 cm wide; petioles 5-7 mm long, stipules on flowering branches ca 2-3 mm long and recurved. *Inflorescences* panicles, irregular, axillary or terminal, up to 8 cm long; ± glabrous. *Flowers* with pedicels to 5 mm long; bract single, ca 1 mm long, awl shaped; bracteoles two, ca 0.5 mm long, awl-shaped; sepals oblong, ca 4-5 mm long; filaments ca 3-4 mm long, the anthers ca 1.5 mm long; ovary with ridges in mature flowers. *Samara* unknown.

BRAZIL: RIO DE JANEIRO: s. loc., *Glaziou 5730* (K; photo F, from B).

No pollen examined due to paucity of flowering material.

When the type specimens of *S. emarginata* (*Glaziou 5730*) and *S. alberti* (*Glaziou 8260*), both from Kew, are compared, they are markedly different in leaf shape, *S. emarginata* being conspicuously more elongate. However, a photo (F) of the Berlin specimen of *Glaziou 5730* has very broad leaves, and at first glance is almost more similar to *Glaziou 8260* than it is to the Kew specimen of *Glaziou 5730*. Nevertheless I have treated the two as separate taxa based on leaf shape, and the stipule size and direction, but I admit that the distinction is somewhat obscure.

8. *Seguieria laurifolia* H. Walter, Pflanzenr. IV, 83 (Heft 39): 92, 1909. (Type *Glaziou 2488* K; photo F, from C)

Trees or shrubs? *Leaves* lanceolate-elliptic to ± ovate-lanceolate, acute, entire, the margins ± inrolled, the bases obtuse, up to 11 cm long and 4 cm wide; petioles up to 5 mm long, stipules absent on flowering branches. *Inflorescences* panicles, irregular, rarely ± racemes, up to 15 cm long, axillary or terminal,

lightly villous. *Flowers* with pedicels to 6 mm long; bract single, < 1 mm long, awl-shaped; bracteoles two, < 1 mm long, awl-shaped; sepals oblong, ca 4 mm long and 2.2-2.5 mm wide; filaments ca 3 mm long, the anthers ca 1.8 mm long; ovary appearing to have prominent winglets. *Samara* unknown.

Known only from the type collection.

Brazil: rio de janeiro: Juiz de Fora, *Glaziou 2488* (K; photo F, from C).

No pollen examined due to lack of suitable flowering material.

9. *Seguieria foliosa* Benth., Trans. Linn. Soc. London **18:** 236, 1839. (Type *Schomburgk 661* BM, F, K)

S. pachycarpa H. Walter, Pflanzenr. IV, 83 (Heft 39): 93, 1909. (Type *Riedel s.n.*, photo F, from B†)

Trees or shrubs to ca 3 m. *Leaves* ovate-elliptic, entire, acute to slightly mucronulate, the bases obtuse to somewhat rounded, up to 12 cm long and 5 cm wide, mostly 6-8 cm long and ca 4 cm wide; petioles ca 3-5 mm long; stipules to 10 mm long, recurved. *Inflorescences* panicles, irregular, or ± racemes, up to 12 cm long, mostly axillary, lightly pubescent. *Flowers* with pedicels to 1 cm long; bract single, ca 1-1.5 mm long, awl-shaped; bracteoles two, ca 0.6-0.8 mm long, awl-shaped; sepals oblanceolate, ca 3-4 mm long and 1.5-2 mm wide; filaments ca 2 mm long, somewhat thickened at the base, the anthers ca 1 mm long. *Samara* up to 3.5 cm long, brown, the base ridged, the stigmatic edge ± straight to slightly convex, the non-stigmatic edge ± straight (Fig. 2B).

Brazil and Guyana.

Brazil: ceara: Maracanau, *Ducke 2576* (NY).
Guyana: Rupununi Dist, *Irwin 797* (US); s. loc., *Schomburgk 661* (BM, F, K).

Pollen grains ca 25μ (E) × ca 30-31μ (P), colpi ca 22-23μ long.

Pollen examined: *Ducke 2576* (NY).

Sect. 2 Seguieria.

sect. *Seguieriella* H. Walter, Pflanzenr. IV, 83 (Heft 39): 94, 1909.

10. *Seguieria paraguayensis* Morong, Ann. N. Y. Acad. Sci. **7:** 210, 1893. (Type *Morong 690* MO)

Trees or shrubs. *Leaves* ovate, mucronate, entire, the bases obtuse to slightly rounded, up to 8.5 cm long and 6.5 cm wide, glabrous, ± leathery; petioles up to 1.5 cm long; stipules up to 3 mm long, ± straight to erect, mostly on older branches. *Inflorescences* panicles, ca 6 cm long, mostly axillary, few-flowered, lightly pubescent. *Flowers* with pedicel length variable, up to 7 mm long; bract single, ca 2.5-2.8 mm long, lanceolate; bracteoles absent; sepals ± equal, oblong. ca 4 mm long and ca 2 mm wide; filaments ca 2.5-3 mm long, the anthers ca 2 mm long. *Samara* up to 3 cm long, yellow-brown, the stigmatic edge convex.

Paraguay: San Bernardino, *Hassler 3712* (F, NY), 3887 (F, NY); vic of Ypacaray, *Hassler 12400* (MO, NY); s. loc., *Fiebrig 869* (A, F, US), *Hassler 1764* (NY), s.n. (F), *Morong 690* (MO).

Pollen grains ca 17μ (E) × ca 26μ (P), colpi ca 19μ long.

Pollen examined: *Hassler 12400* (MO).

11. *Seguieria glaziovii* Briq., Ann. Conserv. Jard. Bot. Geneve **4:** 214, 1900. (Type *Glaziou 13126* G, K)

Trees to 30 m. *Leaves* elliptic-lanceolate, mucronate, entire, the bases obtuse, up to 11 cm long and 4.5 cm wide, ± leathery; petioles ca 0.5-1 cm long; stipules ca 0.5 cm long, slender. *Inflorescences* irregular panicles, up to 18 cm long, mostly axillary, rarely terminal, rachis pubescent. *Flowers* with pedicels up to 8 mm long; bract single, up to 1.5 mm long, awl-shaped, keeled at the base; bracteoles two, ca 0.8 mm long, awl-shaped; sepals subequal, ca 4-5 mm long and 2-2.5 mm wide, veined, prominently so in fruit; filaments ca 3 mm long, the anthers ca 2.2 mm long. *Samara* ca 2.5-3 cm long, black on drying, the stigmatic edge ± straight.

BRAZIL: SANTA CATARINA: Brusque, *Klein 288* (NY), *290* (NY); *Reitz 3464* (US); Ibirama, *Reitz & Klein 1563* (NY); Itajai, *Klein 1183* (NY), *Reitz & Klein 2257* (NY, US), *2409* (NY, US).

Pollen grains ca 18-19μ (E) × ca 29-30μ (P), colpi ca 25μ long.
Pollen examined: *Reitz & Klein 2409* (NY).

12. *Seguieria affinis* Heimerl in von Wettstein, Ergebn. Exped. Sudbrasil 1901 **1:** 6, 1908. (Lectotype selected: *Novaes 1027* US; syntype *Novaes 1026* WU, not seen).

S. rigida H. Walter, Pflanzenr. IV, 83 (Heft 39): 98, 1909. (Syntypes *de Moura 985* LE, B†; *Riedel s.n.* LE, B†, all not seen)

Trees, to 18 m. *Leaves* lanceolate-elliptic, mucronulate, entire, the bases obtuse, up to 11 cm long and 5 cm wide, glabrous to slightly pubescent, ± leathery; petioles to 6-7 mm long; stipules to 4.5-5 cm long on older stems, slender. *Inflorescences* panicles or racemose, to 20-25 cm long, axillary or terminal, pubescent. *Flowers* with pedicels ca 6-7 mm long; bract single, ca 1-1.5 mm long, awl-shaped; bracteoles two, ca 0.6 mm long, ± triangular; sepals subequal, oblong and narrowed at the base, ca 4.5 mm long and 3-3.5 mm wide, veined; filaments ca 3.5 mm long, the anthers ca 1.7 mm long. *Samara* ca 3.5 cm long, brown, the base darkened, the stigmatic edge convex.

Brazil.

BRAZIL: MINAS GERAES: rd to Barroso, *Mexia 4444* (BM, F, MO); rd to São Miguel, *Mexia 4358* (BM, F, K, MO). SAO PAULO: Campinas, *Novaes 1027* (US).

Pollen grains ca 18-19μ (E) × ca 28-29μ (P), colpi ca 21-22μ long.
Pollen examined: *Mexia 4358* (F).

13. *Seguieria macrophylla* Benth., Trans. Linn. Soc. London **18:** 235, 1839. (Type *Schomburgk 348* K)

Albertokuntzea macrophylla (Benth.) O. Ktze., Rev. Gen. Pl. **2:** 550, 1891.

Lianas? Leaves ovate-elliptic, acute, entire, the bases rounded-obtuse, up to 17 cm long and 9 cm wide, leathery; petioles ca 0.5-1 cm long; stipules up to 6 mm long, recurved, stout. *Inflorescences* panicles, up to 40 cm long, axillary or terminal, pubescent. *Flowers* with pedicels ca 6 mm long; bract single, ca 1.2 mm long, awl-shaped; bracteoles two, ca 0.8 mm long, awl-shaped; sepals subequal, ca 4 mm long and 1.6-2.4 mm wide; filaments ca 2.5 mm long, the anthers ca 1.7 mm long.

Samara up to 3.1 cm long, brown-black on drying, the stigmatic edge ± straight.

Brazil, Guyana, Peru and Venezuela.

Brazil: amazonas: nr mouth of Rio Embira, *Krukoff 5206* (A). maranhao: Maracassume River Basin, *Krukoff 1924* (A, BM, MO). pará: Belem, *Archer 7936* (F, MO); Bouche de lac de Faro, *Ducke 8657* (US).

guyana: Essequibo River, *Schomburgk 348* (K); Kanuku Mts, *Smith 3650* (A).

Peru: loreto: Yurimaguas, *Poeppig 2176* (F).

Venezuela: delta: Cano del Corisal, *Bond et al. 208* (GH). without province: Sacupana, *Rusby & Squires 57* (F, MO).

No pollen examined due to lack of suitable flowering material.

14. *Seguieria brevithyrsa* H. Walter, Pflanzenr. IV 83 (Heft 39): 87, 1909. (Type *Rusby 1353* BM, GH, NY)

S. inerensis Britton, Bull. Torrey Bot. Club **48:** 331, 1921. (Type *Britton, Freeman & Nowell 2527*, probably NY)

Shrubs, decumbent, or woody vines. *Leaves* elliptic-lanceolate, acute-acuminate, entire, the bases obtuse, up to 11 cm long and 4 cm wide, glabrous, ± leathery; petioles up to 1 cm long; stipules ca 4-6 mm long, recurved. *Inflorescences* racemes or weak panicles, up to 10 cm long, axillary, glabrous, black on drying. *Flowers* with pedicels up to 6 mm long; bract single, 3-4 mm long, lanceolate; bracteoles absent; sepals subequal, oblong, ca 5 mm long and 3.5 mm wide; filaments ca 3 mm long, the anthers ca 2 mm long. *Samara* up to 4.5 cm long, black on drying, ± slightly ridged at the base, the stigmatic edge straight or concave.

Reported only from Trinidad and Bolivia.

Trinidad: *Smith 2706* (US).

Bolivia: s. yungas: San Bartolomé, *Krukoff 10166* (F, MO, US). without province: Guanai, *Rusby 1353* (GH, NY).

No pollen examined due to lack of suitable flowering material.

Walter (1909) included this species in his sect. 1, *Euseguieria*, characterized by the extra tubercle at the base of the fruit, a condition difficult to detect in flowers, and certainly not visible in the single collection from which he described the species. The collection of *Krukoff 10166*, in fruit only, which agrees with Rusby *1353* in leaf shape, stipule size and direction, inflorescence characters, and blackening on dessication, as well as in geographic location, has two slight ridges on the flattened sides of the ovary but no evidence of the tubercle. For this reason I have transferred this species to the sect. *Seguieria*.

15. *Seguieria parvifolia* Benth., Trans. Linn. Soc. London **18:** 235, 1839. (Type *Tweedie s.n.* K)

Seguieria guaranitica Speg., Anal. Soc. Cient. Argent **16:** 88, 1883.
Albertokuntzea parvifolia (Benth.) O. Ktze., Rev. Gen. Pl. **2:** 550, 1891.
Seguieria elliptica R. E. Fries, Ark. Bot. Stockh. **8:** 20, 1909, non H. Walter [Pflanzenr. IV, 83 (Heft 39): 89, 1909] (Type *Fries 313* US).

Shrubs, ± scandent. *Leaves* ovate-elliptic to ovate, mucronulate, entire, the bases obtuse, up to 11 cm long and 5 cm wide, ± leathery; petioles to 8-9 mm long; stipules to 1 cm long, ± straight, mostly on older branches. *Inflorescences*

panicles or rarely racemose, up to 20 cm long, axillary or terminal, pubescent. *Flowers* with pedicels up to 6 mm long; bract single, ca 1-1.2 mm long, awl-shaped, membranaceous; bracteoles two, ca 0.8 mm long, awl-shaped, membranaceous; sepals subequal, ca 4.5 mm long and up to 3 mm wide, veined, conspicuously so at the base in fruit; filaments ca 3.5 mm long, the anthers ca 1.7 mm long. *Samara* up to 4 cm long, green-brown, the stigmatic edge convex, rarely ± straight, a small protuberance near the tip (Fig. 2E).

A variable species widely distributed in South America.

BRAZIL: PARANA: Iguacu Ntl Pk, *Pereira 5314* (F). RIO GRANDE DO SUL: Vila Elsa, *Rambo 41919* (F, MO).

ARGENTINA: MISIONES: Acaragua, *Bertoni 3172* (F); Campo Grande, *Schwarz 4419* (MO); Duranona, *Schwarz 4256* (MO); Puerto Iguazu, *Meyer 5354* (F); Puerto Rico, *Schwindt 578* (MO); Santo Pipo, *Schwarz 4267* (MO); Santa Rita *Schwarz 4204* (F). SALTA: Bosque al Sud, *Lillo 11266* (F); La Callera, *Pierotti 203* (F); betw El Piquete & Palmero, *Ragonese 88* (F).

PARAGUAY: CENTRAL DEPT: Villa Elisa, *Pedersen 3152* (MO, US). GAIRA: Villarrico *Hassler 3758* (F, MO); s. loc., *Hassler 1849e* (NY), *3786* (F, NY), *7055* (MO, NY), *Morong 645* (MO).

Pollen grains ca 21μ (E) × ca 28-29μ (P), colpi ca 17μ long, exine ca 1.5μ in thickness.

Pollen examined: *Hassler 7055* (MO).

16. *Seguieria americana* L., Syst. Nat. ed. 10, 1074, 1759. (Neotype selected: *Smith 342* MO, isoneotypes F, US)

S. aculeata Jacq., Select. Stirp. Amer. 170, 1763.
Albertokuntzea americana (L.) O. Ktze., Rev. Gen. Pl. **2**: 550, 1891.

Shrubs, scandent or climbers. *Leaves* ovate or ovate-elliptic, acute to slightly accuminate and emarginate, the bases obtuse, up to 10 cm long and 7 cm wide, glabrous, papery to slightly leathery; ± sessile to petioles 3 mm long; stipules up to 1 cm long, recurved. *Inflorescences* panicles, up to 15 cm long, axillary or terminal, pubescent. *Flowers* with pedicels 6-7 mm long, slender; bract single, ca 0.5 mm long, membranaceous; bracteoles two, ca 0.4 mm long, membranaceous; sepals ± unequal, oblong, ca 3.5-4 mm long and 1.2-2.5 mm wide; filaments ca 2-2.5 mm long, the anthers ca 1.2 mm long. *Samara* ca 3.5 cm long, green-brown, the stigmatic edge ± straight.

South America.

COLOMBIA: ATLANTICO: Barranquilla, *Dugand 106* (F), *474* (F), *1112* (F); betw Galapa & Baranca, *Dugand 272* (F, US); Puerto Colombia, *Bro. Elias 1020* (F, US); betw Ponadera & Santa Rita, *Dugand 683* (F); Soledad, *Dugand 1128* (F). MAGDALENA: La Paz, *Haught 2330* (F). SANTA MARTA: s. loc., *Smith 342* (F, MO, US).

VENEZUELA: ARAGUA: Tuy Valley, *Pittier 12201* (US).

BOLIVIA: s. loc., *Williams 249* (BM, NY).

PARAGUAY: WITHOUT PROVINCE: *Fiebrig 776* (F), *Hassler 8393* (F), *11502* (F).

Pollen grains ca 21-22μ (E) × ca 30μ (P), colpi ca 20-21μ long.

Pollen examined: *Dugand 683* (F).

Excluded collection: *Broadway s.n.* (K). This is the type collection for *S. cordata* Britton (Bull. Torrey Bot. Club **48**: 331, 1921), which has neither flowers nor fruit and is impossible to describe or identify.

B. Tribe Rivineae Agardh, Aphor. 218, 1825. Inflorescences spikes or racemes; fruits not a samara. (Type *Rivina L.*)

a. Flowers unisexual; fruits covered with hooked spines; Australia .....12. *Monococcus*
aa. Flowers perfect, rarely unisexual; fruits not covered with hooked spines; South and Central America.
b. Fruit a 4-6 hooked achene; inflorescences elongate spikes; calyx of 4 narrow-lanceolate, erect sepals .....11. *Petiveria*
bb. Fruit an utricle or drupe not hooked; inflorescences racemes; calyx not of 4 narrow-lanceolate, erect sepals.
c. Flowers ± zygomorphic; sepals connate at the base in late flower and fruit .....9. *Hilleria*
cc. Flowers ± actinomorphic; sepals not becoming connate in late flower and fruit.
d. Leaves ± deltoid; stamens 4; fruit a red, orange, or purple drupe ....6. *Rivina*
dd. Without the above combination of characters.
e. Racemes from woody stems, not pendulous; fruit a purple or black drupe .....7. *Trichostigma*
ee. Racemes not from woody stems or if so, then pendulous; fruit an utricle.
f. Racemes pendulous; flowers perfect or functionally unisexual, the pistillate with 4-6 rudimentary stamens, the sepals net-veined .....10. *Ledenbergia*
ff. Racemes ± erect; flowers perfect, the stamens 12-25, the sepals with ca 3 parallel veins .....8. *Schindleria*

6. RIVINA

Rivina L., Sp. Pl. 121, 1753. (Type *R. humilis* L.)

Rivinia L., Gen. Pl. ed. 5, 57, 1754.
Piercea Mill., Gard. Dict. ed. 7, 1759.
Solanoides Moench, Meth. 307, 1794.
Tithonia L. ex. O. Ktze., Rev. Gen. Pl. **2**: 552, 1891.

Monotypic.

1. *Rivinia humilis* L., Sp. Pl. 122, 1753. (Type LINN, not seen; from IDC Micro-Edition 163.1)

R. laevis L., Mant. 41, 1767.
R. purpurascens Schrad., Gen. Pl. Illustr. 17, *pl.* 5, 1808.
R. portulaccoides Nutt., Trans. Amer. Phil. Soc. II, **5**: 167, 1837. (Type *Nuttall s.n.* BM)
For a complete synonomy list, see: Ann. Missouri Bot. Gard. **48**: 76, 1961, By K. Raeder.

Herbs or subshrubs, woody at the base, to 70 cm. *Leaves* deltoid to ovate, acuminate, entire, the bases truncate to rounded, rarely oblique, up to 12 cm long and 6 cm wide, glabrous to finely pubescent; petioles up to 6 cm long. *Inflorescences* racemes, up to 15 cm long at maturity, terminal or axillary. *Flowers* perfect, actinomorphic, with pedicels to 8 mm long in fruit; bract single, ca 1.3-2 mm long, awl-shaped, ± deciduous; bracteoles two, ca 0.2-0.3 mm long, closely appressed to the sepals; sepals 4, subequal, oblong, ca 2-3 mm long, white or pink; stamens 4, alternate, the filaments ca 1.2-2 mm long, the anthers ca 0.8-1 mm long; ovary globose to elliptic, compressed laterally, 1-carpellate, the style short but distinct, ca 0.3-0.5 mm long, the stigma capitate. *Fruit* a drupe, up to 4.5 mm in diam, ± globose, orange, red, or purple; seed one, lens shaped, ca 2.5-3.5 mm in diam, the testa pubescent.

Southwestern United States to Florida, south through Central and South America to Argentina; also introduced into Africa and reported from Asia and Australia (Heimerl, 1934).

UNITED STATES: ARIZONA: *Gilman* 53 (MO); *Jones s.n.* (MO). FLORIDA: *Blanton 6426* (MO); *Curtiss 2340* (MO), 5383 (MO); *Hitchcock 302* (MO); *Hood s.n.* (MO); *Janish & Janish 454* (MO); *Moldenke 325* (MO); *Murrill s.n.* (MO); *Nash 1273* (MO); *O'Neill s.n.* (MO); *Palmer 458* (MO), *459* (MO), *27344* (MO), *Reynolds s.n., 11565* (MO); *Seibert 1239* (MO); *Small & Small 4162* (MO); *Tracy 6429* (MO), *9349* (MO); *Webber 376* (MO). LOUISIANA: *Riddell s.n.* (MO); *Short s.n.* (MO). OKLAHOMA: *Houghton 4049* (MO). TEXAS: *Bush 1128* (MO); *Chandler 7040* (MO); *Davis s.n.* (MO); *Eggert s.n.* (MO); *Ferris & Duncan 2632* (MO), *2890* (MO), *3151* (MO); *Heller 1422* (MO); *Jermy s.n.* (MO); *Joor s.n.* (MO); *Letterman 423* (MO); *Lindheimer 295* (MO), *374* (MO), *1113* (MO), *s.n.* (MO); *Mackenzie 48* (MO); *Moore & Steyermark 3014* (MO); *Mueller 8094* (MO), *s.n.* (MO); *Orcutt 5886* (MO); *Palmer 1170* (MO), *9835* (MO), *10170* (MO), *10194* (MO), *10357* (MO), *14351* (MO), *26782* (MO), *30521* (MO); *Parks 1359* (MO); *Reverchon 812* (MO), *1588* (MO); *Ruth 229* (MO), *s.n.* (MO); *Tracy 9351* (MO), *9421* (MO); *Traverse 1086* (MO); *Trelease s.n.* (MO); *Ward s.n.* (MO); *Wilkinson 155* (MO); *Young s.n.* (MO).

MEXICO: BAJA CALIFORNIA: *Gentry 4148* (MO); *Jones 24020* (MO). CHIHUAHUA: *Gentry 1846* (MO); *Palmer 254* (MO). COAHUILA: *Palmer 729* (MO); *Stewart s.n.* (MO); *Warnock & Barkley 14720* (MO); *Wynd & Mueller 292* (MO). COLIMA: *West 3529* (MO). HIDALGO: *Pringle 7428* (MO). NUEVO LEÓN: *Bro. Arsène 6138* (MO). SINALOA: *Gentry 6105* (MO). SONORA: *Gentry 1078A* (MO), *1606* (MO); *Wiggins & Rollins 340* (MO); *Wright 1729* (MO). TAMAULIPAS: *Clark 6622* (MO); *Meyer & Rogers 2484* (MO); *Palmer 127* (MO), *136* (MO). YUCATAN: *Gaumer 322* (MO), *1599* (MO); *Gaumer et al. 23419* (MO), *23561* (MO); *Lundell 858* (MO), *942* (MO). WITHOUT STATE: *Parry 776* (MO).

BRITISH HONDURAS: *Lundell 380* (MO); *Schipp 469* (MO).

HONDURAS: *Williams & Molina 10510* (MO).

GUATEMALA: *Steyermark 47631* (MO).

COSTA RICA: *Greenman & Greenman 5423* (MO); *Rojas 412* (MO); *Smith A667* (MO); *Thomas 6183* (MO).

PANAMA: *Allen 336* (MO), *889* (MO); *Carleton 52* (MO); *Cooper 77* (MO); *Duke 5365* (MO); *Hunter & Allen 579* (MO); *von Wedel 609* (MO), *256* (MO), *2882* (MO); *White & White 88* (MO); *Woodson & Schery 1028* (MO); *Woodson et al. 1807* (MO).

BAHAMAS: *Wilson 7981* (MO), *8016* (MO), *8138* (MO).

CUBA: *Combs 153* (MO), *186* (MO); *Curtiss 720* (MO); *Pollard 3* (MO); *Pollard et al. 190* (MO); *Van Hermann 335* (MO).

DOMINICAN REPUBLIC: *Valeur 486* (MO).

GRENADA: *Broadway s.n.* (MO).

GUADELOUPE: *Grisebach s.n.* (MO).

JAMAICA: *Crosby et al. 90* (MO); *Hitchcock s.n.* (Kingston) (MO), *s.n.* (Constant Springs) (MO); *Lloyd 1012* (MO); *Nichols 189* (MO); *Yuncker 17074* (MO).

MARTINIQUE: *Sieber 48* (MO).

PUERTO RICO: *Heller 4523* (MO), *6165* (MO); *Otero 385* (MO); *Sintenis 306* (MO), *1655* (MO); *5527* (MO).

ST. CROIX: *Eggers s.n.* (MO); *Ricksecker 134* (MO).

COLOMBIA: MAGDALENA: Rincon Hondo, *Allen 236* (MO), *375* (MO); Santa Marta, *Smith 1163* (MO). VALLE: N of Palmira, *Garcia 6394* (MO).

VENEZUELA: AMACURO: Lower Orinoco, *Rusby & Squires 80* (MO). MÉRIDA: Colonia Tovar, *Fendler 1088* (MO). MARGARITA I, *Miller & Johnston 263* (MO).

BRAZIL: CEARA: Baturite, *Schery 429* (MO). RIO DE JANEIRO: vic of Rio de Janeiro, *Dusen 105* (NY).

URUGUAY: *Herter 10078* (MO).

ARGENTINA: BUENOS AIRES: Zorate, *Krapovickas 3020* (MO). CHACO: Campo Bonazzola, *Rodrigo 2528* (NY), *2679* (NY); s. loc., *Jorgensen 1998* (MO). CÓRDOBA: Río Grande, *Job 469* (NY). ENTRE RIOS: Tezanos Pindo, *Huidobro 3641* (MO). FORMOSA: Espinilloa, *Morel 7196* (MO); La Frontera, *Morel 8380* (MO); Siete Palmas, *Morel 8448* (MO). MISIONES: Oro Verde, *Schwarz 7826* (MO); Posadas, *Schwarz 5649* (MO). SALTA: Balboa,

Cabrera 3135 (NY); Coronel Moldes, *Meyer 3748* (NY). SANTIAGO DEL ESTERO: Yutuyacu, *Legname 43* (MO).

PARAGUAY: Villarica, *Jorgensen 3904* (MO, NY). Ypacaray, *Hassler 12198* (MO); s. loc., *Morong 263* (MO).

BOLIVIA: LA PAZ: Coripata, *Bang 2083* (MO), *Buchtien 8257* (NY); Coroico, *Buchtien s.n.* (MO). SANTA CRUZ: Yorochito, *Steinbach 8146* (MO). WITHOUT PROVINCE: *Bang 574* (MO).

ECUADOR: Albermarle I, (Galápagos I) *Stewart 1434* (MO).

SIAM: *Zimmerman 146* (MO).

HAWAII: OAHU: *Fosberg 9388a* (MO).

Pollen grains single, prolate, spheroidal, ca 35μ (E) × ca 35μ (P), 15 colpate, 5 at each pole and 5 perpendicular to the equator, colpi ca 11μ long, exine ca 2-2.5μ in thickness, sexine ± equal to nexine and very finely reticulated.

Pollen examined: *Orcutt 5886* (MO); *Pringle 7428* (MO); *Ruth 229* (MO).

Rivina humilis is one of the most variable species in the *Phytolaccaceae*. Walter (1909) recognized three species, *R. humilis*, *R. portulaccoides* Nutt., and *R. purpurascens* Schrad., based on sepal color and size, erectness of the inflorescence, and relationship of leaf length to inflorescence length, all of which are overlapping characters. I have reduced all to synonomy under *R. humilis*. Some of the variability may result from the diverse weedy habitats in which *Rivina* is frequently found—some specimens are almost "stunted" in appearance, wiry, small leaves, short internodes, etc., and present a marked contrast to the more robust collections. However, to give each of these variants species rank is unsound.

7. TRICHOSTIGMA

Trichostigma A. Rich. in Sagra, Hist. Fis. Pol. Nat. Cuba, Part 2, Hist. Nat. **10:** 306, 1845. [Type *T. octandrum* (L.) H. Walter]

Rivinia Mill., Gard. Dict. Abridg. ed. 4, 3, 1754.
Villamilla Ruiz & Pavon ex Moq. in DC., Prodr. **13**(2): 10, 1849.

Shrubs or trailing vines. *Leaves* ovate to elliptic, acute to long acuminate, entire, the bases cordate to obtuse, punctate, ± glabrous to sparsely hairy on veins beneath; petiolate. *Inflorescences* racemes, axillary or terminal. *Flowers* perfect, ± actinomorphic, pedicellate; bract single, awl-shaped to lanceolate; bracteoles two, minute; sepals 4, ± equal, oblong, green to white; stamens 8-25, separate, irregularly deposited in two whorls, ± sessile or filaments filiform, the anthers linear; ovary 1-carpellate, cylindrical to ± globose, the style short or absent, the stigma generally penicellate. *Fruit* a drupe, ± globose, black to red-purple; seed 1, lens shaped, the testa red-brown.

Northern South America, Central America and the West Indies; a genus of three species.

Pollen grains subprolate or prolate spheroidal, ca 27-37μ (E) × ca 27-35μ (P), 3-colpate with colpi 22-23μ long, or 15 colpate, 5 at each pole and 5 perpendicular to the equator with colpi ca 4.5-6μ long, exine ca 2-2.3μ in thickness, sexine ± equal to nexine or slightly thicker than nexine, and ± smooth.

The results of pollen analysis, 3-colpate grains in *Trichostigma octandrum* L., and 15-colpate in a 5-5-5 pattern for *T. polyandrum* (Loes.) H. Walter and *T. peruvianum* (Moq.) H. Walter, are perplexing in view of the very similar floral

and vegetative morphology, especially of *T. octandrum* and *T. polyandrum*. Although the two pollen types are very different in terms of aperture structure, I make no recommendation for division of the genus based solely on this feature.

a. Leaf bases cordate, petioles pubescent ..... 1. *T. peruvianum*
aa. Leaf bases obtuse, petioles glabrous.
  b. Stamens 20-25; inflorescences few and more than 10 cm long, the pedicels 10 mm or longer ..... 2. *T. polyandrum*
  bb. Stamens 8-10; inflorescences many and up to 10 cm long; the pedicels up to 10 mm long ..... 3. *T. octandrum*

1. *Trichostigma peruvianum* (Moq.) H. Walter, Pflanzenr. IV, 83 (Heft 39): 111, 1909.

Rivina peruviana Moq. in DC., Prodr. **13**(2): 10, 1849. (Type *Matthews 1455* G, K)
Villamilla tinctoria Ruiz & Pavon (Fl. Peru Chile, *pl. 402*) ex Moq., loc. cit.
Ledenbergia roseo-aenea Lem., Illustr. Hort. **16**: *pl. 591*, 1869.
Villamilla peruviana Hook. f. in Benth. & Hook. f., Gen. Pl. **3**: 81, 1880.
Rivina roseoaenea (Lem.) O. Ktze., Rev. Gen. Pl. **2**: 551, 1891.
Villamilla roseo-oenia (Lem.) Rusby, Mem. Torrey Bot. Club **6**: 110, 1896.

Shrubs to 2 m. *Leaves* ovate, acuminate, entire, the bases cordate, up to 27 cm long and 11 cm wide, sparsely hairy on veins beneath; petioles 2-3 cm long, conspicuously pubescent. *Inflorescences* mostly terminal, 25-30 cm long, rachis pubescent. *Flowers* with pedicels up to 8 mm long; bract single, 1.5 mm long; bracteoles two, ca 0.3-0.4 mm long, triangular; sepals ca 4 mm long; stamens 10-12, usually in two whorls, the filaments ca 1.5-2 mm long, the anthers ca 1.5-1.8 mm long; style short and thick or absent. *Drupe* ca 4-6 mm in diam, black.

Peru and rarely Ecuador.

ECUADOR: s. loc., *Mexia 7221* (US).
PERU: LORETO: Balsapuerto, *Killip & Smith 28690* (F); *Klug 2976* (F, MO); Soledad, *Killip & Smith 29696* (F); betw Yuramaguas & Balsapuerto, *Killip & Smith 28344* (F). SAN MARTÍN: San Roque, *Williams 6935* (F).

Pollen grains prolate spheroidal, ca 30-32μ (E) × ca 30-32μ (P), 15-colpate, 5 at each pole and 5 perpendicular to the equator, colpi ca 4.5-5.5μ long, exine ca 2μ in thickness, sexine ± equal to nexine and ± smooth.

Pollen examined: *Klug 2976* (MO); *Williams 6935* (F).

2. *Trichostigma polyandrum* (Loes.) H. Walter, Pflanzenr. IV, 83 (Heft 39): 112, 1909.

Rivina polyandra Loes., Bot. Jahrb. **23**: 123, 1896. (Type *Rothschuh 114* B†)
Villamilla polyandra (Loes.) H. Walter, loc. cit. **37**(Beibl. 85): 24, 1906.

Shrubs, ± erect or trailing vines. *Leaves* ovate to elliptic, acute to long acuminate, the bases obtuse, up to 16 cm long and 8 cm wide, ± glabrous; petioles 2-3 cm long. *Inflorescences* mostly terminal, occasionally axillary, up to 25 cm long. *Flowers* with pedicels to 15 mm long; bract single, ca 1.5-2 mm long; bracteoles two, ca 0.5 mm long; sepals 4-5 mm long, enlarging in fruit to ca 8-9 mm long; stamens 20-25, deciduous, sessile to filaments 0.6 mm long, the anthers ca 2 mm long; the style short, the stigma sparsely penicellate. *Drupe* ca 4.5-5.5 mm in diam, red-purple.

Central America.

Costa Rica: *Rojas 441* (MO); *Standley & Valedio 44442* (US), *46272* (US).
panama: *von Wedel 714* (MO), *752* (MO), *926* (MO), *940* (MO), *1439* (MO), *1547* (MO), *2571* MO); *Woodson et al. 1832* (MO).

Pollen grains prolate spheroidal, ca 27-29μ (E) × ca 27-29μ (P), 15 colpate, 5 at each pole and 5 perpendicular to the equator, colpi ca 5-6μ long, exine ca 2.3μ in thickness, sexine ± equal to nexine or slightly thicker than nexine, and ± smooth.

Pollen examined: *Standley & Valerio 44442* (US), *46275* (US).

3. *Trichostigma octandrum* (L.) H. Walter, Pflanzenr. IV, 83 (Heft 39): 109, 1909.

Rivina humilis var. *scandens* L., Sp. Pl. 122, 1753.
R. octandra L., Cent. Pl. **2**: 9, 1756. (Type LINN, not seen; from IDC Micro-Edition 163.3)
R. dodecandra Jacq. Obs. Bot. **1**: 6, 1764.
R. scandens Mill., Gard. Dict. ed. 8, Rivinia no. 2, 1768.
R. mutisii Willd. ex. Schultes, Mant. **3**: 305, 1827.
R. americana Raf., Fl. Tellur. **3**: 56, 1837.
Trichostigma rivinoides A. Rich. in Sagra, Hist. Cuba **10**: 306, 1845.
Rivina octandra L. var. *obtusifolia* Moq. in DC., Prodr. **13**(2): 11, 1849.
R. ehrenbergiana Klotzsch ex Moq., loc. cit., nom. nud. pro syn. *R. octandra.*
R. moritziana Klotzsch ex Moq., loc. cit., nom. nud. pro syn. *R. octandra.*
Villamilla octandra Hook. f. in Benth. & Hook. f., Gen. Pl. **3**: 81, 1880.

Shrubs, decumbent or woody vines. *Leaves* elliptic, acuminate, entire, the bases obtuse, up to 13 cm long and 6 cm wide, glabrous or pubescent; petioles ca 2-3 cm long. *Inflorescences* ca 10 cm long, mostly axillary. *Flowers* crowded, with pedicels ca 6-7(-10) mm long at maturity; bract single, ca 2-3 mm long, awl-shaped; bracteoles two, ca 0.4-0.5 mm long; sepals 2.5-4 mm long and 1.5-2.5 mm wide, white to green; stamens 8-10, the filaments ca 2-3 mm long, the anthers ca 1.5-2 mm long; style absent, the stigma penicellate. *Drupe* ca 4-5 mm in diam, black.

Widely distributed in Central America, the West Indies and South America.

United States: florida: *Small & Matthaus 9904* (MO).
Mexico: guerrero: *Hinton 14154* (MO). morelos: *Pringle 8491* (MO). sinaloa: *Lamb 418* (MO). tamaulipas: *Palmer 349* (MO). without state: *Rose 14677* (US).
British Honduras: *Gentle 4028* (MO).
Costa Rica: *Smith 1672* (MO).
Panama: *Allen 944* (MO), *17279* (MO); *Terry & Terry 1396* (MO).
Cuba: *Curtiss s.n.* (MO); *Pringle 90* (MO); *Wright 471* (MO).
Guadeloupe: *Duss 2399* (MO); *Bertero s.n.* (MO).
Haiti: *Leonard 9873* (MO); *Leonard & Leonard 13623* (MO).
Jamaica: *Harris 11966* (MO); *Yuncker 18185* (MO), *18345* (MO).
Puerto Rico: *Sintenis 3931* (MO), *1016b* (MO).
St. Croix: *Ricksecker 343* (MO); *Ricksecker 325* (MO).
Tobago: *Broadway 2967* (MO).
Trinidad: *Broadway 5118* (MO).
Colombia: magdalena: Santa Marta, *Smith 1718* (MO, NY).
Venezuela: mérida: Colonia Tovar, *Fendler 1087* (MO, NY). monagas: W of Santa Bárbara, *Steyermark 61768* (MO). without state: Punta Predra I, *Rusby & Squires 419* (MO).
Brazil: amazonas: mouth of Rio Embira, *Krukoff 4872* (MO); São Paulo de Olivença, *Ducke 404* (MO); Rio Solimoes, *Krukoff 4507* (MO).
Argentina: salta: nr Tariga River, *Eyerdam & Beetle 22800* (MO). misiones: Posadas, *Ekman 1884* (GH).

BOLIVIA: PANDO: jct of Beni & Madre de Dios Rivers, *Rusby 741* (MO). SANTA CRUZ: Missiones Guarayos, *Werdermann 2648* (MO).

PERU: SAN MARTÍN: Juan Jui, *Klug 4185* (MO), *4364* (MO).

Pollen grains subprolate, ca 28-29μ (E) × ca 34-35μ (P), 3-colpate, colpi ca 22-23μ long, exine ca 2μ in thickness, sexine ± equal to nexine and ± smooth.

Pollen examined: *Allen 944* (MO), *17279* (MO).

Excluded collection: Pollard & Palmer 340 (MO, NY). This is a fruiting specimen in which the robustness of the inflorescence, i.e. length of pedicel, size of sepals and overall inflorescence length, is characteristic of *T. polyandrum*, whereas the geographical location and intermediate stamen number, ca 13-14, are typical of *T. octandrum*.

8. SCHINDLERIA

Schindleria H. Walter, Bot. Jahrb. **37**(Beibl. 85): 24, 1906. [Lectotype selected: *S. racemosa* (Britton) H. Walter]

Shrubs, rarely herb-like with woody bases, drying black or yellow-green. *Leaves* elliptic or elliptic to ovate-elliptic, acuminate or acute-acuminate, entire, the bases obtuse, slightly cordate, or rarely ± oblique, glabrous, or sparsely to densely pubescent; petiolate. *Inflorescences* racemes, in some appearing as a delicate spike in bud, mostly axillary, or axillary and terminal. *Flowers* perfect, actinomorphic, pedicellate; bract single, lanceolate and keeled at the base or awl-shaped; bracteoles two, minute, closely appressed to sepals; sepals 4, ± equal, oblong and ± rounded, veins barely discernible or ± prominent; stamens 12-25, irregularly deposited, the filaments filiform, the anthers linear; ovary 1-carpellate, ± cylindrical to ovoid, ± compressed laterally, style absent, stigma penicellate. *Fruit* an utricle, compressed laterally, green-brown; seed 1, lens shaped, testa shiny black.

Two species in Peru and Bolivia.

Pollen grains single, subspheroidal, ca 17-21μ (E) × ca 17-21μ (P), 12-17 pantoporate, ora ca 3-3.5μ in diam, exine ca 2-2.5μ in thickness, sexine ± equal to nexine and finely reticulated.

I have reduced the six species listed by Heimerl (1934) to two, which are best separated by the striking color differences in the dried specimens. *Schindleria racemosa* (Britton) H. Walter has inflorescences and leaves drying black or brown-black and includes *S. glabra* H. Walter and *S. mollis* H. Walter, both of which were based on single collections.

Schindleria densiflora (O. Ktze) Monachino, retaining its green color or becoming yellow on drying, comprises a variable group of specimens in terms of leaf base and texture. In flower structure, however, the group is much more uniform and no character or set of characters serves to separate this complex into distinctive alliances. Monachino (1952) first proposed this treatment, although admittedly on insufficient material, and elucidated the nomenclatural problems involved with it. With the exception of *Bang 2607*, the type of *S. rivinoides* H. Walter and about which I maintain some reservations concerning conspecificity with *S. densiflora*, members of the group are coarse, weedy semi-shrubs found in southern Peru and northern Bolivia.

a. Plants turning black or brown-black upon dessication .....1. *S. racemosa*
aa. Plants remaining green or turning yellow upon dessication .....2. *S. densiflora*

1. *Schindleria racemosa* (Britton) H. Walter, Bot. Jahrb. **37**(Beibl. 85): 24, 1906. (Lectotype selected: *Bang 414* MO; isolectotypes F, NY, US; syntypes *Rusby 743* K, MO, NY)

Villamilla racemosa Britton in Rusby, Mem. Torrey Bot. Club **4**: 251, 1895. (Syntypes *Bang 414* NY; *Rusby 743* NY)
Schindleria glabra H. Walter, Bot. Jahrb. **37**(Beibl. 85): 24, 1906. (Type *Weberbauer 1168* B†, not seen)
S. mollis H. Walter, Pflanzenr. IV, 83 (Heft 39): 116, 1909. (Type *Lobb 691,* photo F, from W)

Shrubs, or herbs with woody bases, black on drying. *Leaves* elliptic, acute-acuminate, entire, the bases obtuse, up to 15 cm long and 6 cm wide, slightly to very pubescent, especially on the veins beneath; petioles ca 1.5-4 cm long. *Inflorescences* racemes, up to 28 cm long, axillary or terminal. *Flowers* with pedicels ca 6-8 mm long; bract single, ca 1.2-1.5 mm long, lanceolate and keeled at the base; bracteoles two, minute, ca 0.1-0.2 mm long, triangular and closely appressed to sepals; sepals ca 2-3.5 mm long and 1.5-1.7 mm wide, veins barely discernible; stamens ca 12-15, the filaments ca 1.2-2 mm long, the anthers ca 1.2-1.5 mm long; ovary slightly elongate. *Utricle* ca 2 mm in diam.

Bolivia: la paz: Colaya, *Mexia 4302* (GH); Coroico, *Buchtien 3772* (NY, US); Yungas, *Bang 414* (F, MO, NY, US); *Rusby 743* (K, MO, NY, US). santa cruz: Bella Vista, *Buchtien 6291* (US).

Pollen grains ca 21μ (E) × ca 21μ (P), 12-15 pantoporate, ora ca 3μ in diam, exine ca 2.5μ in thickness.

Pollen examined: *Rusby 743* (MO).

2. *Schindleria densiflora* (O. Ktze.) Monachino, Phytologia **4**: 39-41, 1952.

Rivina densiflora O. Ktze., Rev. Gen. Pl. **3**(3): 268, 1898. (Type *Kuntze s.n.* NY, not seen)
Schindleria rosea H. Walter, Bot. Jahrb. **37**(Beibl. 85): 24, 1906. (Type *Bang 1292* MO)
S. rivinoides H. Walter, loc. cit. (Type *Bang 2607* MO)
S. weberbaueri O. C. Schmidt, Notizbl. Berlin Bot. Gart. **8**: 313, 1923. (Type *Weberbauer 6758* F, GH, MO, NY)

Shrubs, or herbs with woody bases, to 3 m, green to yellow on drying. *Leaves* elliptic to ovate-elliptic, acuminate, entire, the bases obtuse, slightly cordate or rarely ± oblique, size variable, up to 20 cm long and 7 cm wide, mostly glabrous, some sparsely pubescent on veins beneath; petioles to 8.5 cm long. *Inflorescences* racemes (appearing as delicate spikes in bud), up to 35 cm long (in fruit), mostly axillary, rarely terminal. *Flowers* with pedicels ca 7-9 mm long at maturity; bract single, ca 1 mm long, awl-shaped; bracteoles two, ca 0.2 mm long, closely appressed to sepals; sepals 2-3 mm long, some prominently veined; stamens ca 15-25, the filaments ca 1.5 mm long, the anthers ca 1 mm long. *Utricle* ovoid, compressed laterally and ridged on the edges, ca 1.8-1.9 mm in diam, testa wrinkled, yellow-brown.

Bolivia and Peru.

Bolivia: cochabamba: Chimore, *Cardenas 5482* (US); s. loc., *Steinbach 9361* (GH, NY). la paz: Mapiri, *Buchtien 1694* (GH, US). santa cruz: Samaipata, *Steinbach 8201* (GH). without province: N Yungas, *Buchtien 4327* (US); s. loc., *Bang 2607* (F, GH, MO).

Peru: ayacucho: betw Huanta & Río Apurimac, *Killip & Smith 23092* (NY, US).

CUZCO: Lares Valley, *Weberbauer 7924* (F, GH, MO, NY); Manto-Lares, *Marin 2164* (F); Hacia Pilcopata, *Vargas 13282* (US); Quincemil, *Vargas 7746* (MO); betw Santo Isabel & Mistiana, *Scolnik 906* (NY). HUANUCO: Divisoria, *Woytkowski 34509* (MO); Tal des Mayro, *Weberbauer 6758* (F); Tingo María, *Asplund 12488* (US). MADRE DE DIOS: s. loc., *Vargas 16931* (US). PUNO: vic of Santo Domingo, *McCarroll 54* (NY).

Pollen grains ca 21μ (E) × ca 21μ (P), 12-17 pantoporate, ora ca 3-3.5μ in diam.

Pollen examined: *Woytkowski 34509* (MO).

9. HILLERIA

Hilleria Vell., Fl. Flumin. 47, **1**: *pl. 122*, 1825. [Type *H. latifolia* (Lam.) H. Walter]

Mohlana Mart., Nov. Gen. Sp. Pl. **3**: 171, *pl. 290*, 1829.

Herbs, robust, some species suffrutescent at the base, to 1.5 m. *Leaves* ovate to elliptic, acute, acuminate, or long acuminate, entire, the bases obtuse, ± glabrous above to sparsely hairy on the veins beneath; petiolate. *Inflorescences* racemes, axillary or terminal, ± black on drying. *Flowers* perfect, ± zygomorphic, pedicellate; bract single, awl-shaped; bracteoles two, minute, visible only in bud; sepals 4, unequal, the lowermost enlarging conspicuously in fruit and somewhat uniting at the base with the 2 laterals; stamens 4 or 8-13, alternate or deposited irregularly, the filaments filiform, the anthers 2× longer than broad; ovary spherical or slightly compressed laterally, 1-carpellate, the styles present or absent, the stigma feathery or capitate. *Fruit* an utricle, lens-shaped, ridged on the edges, pericarp wrinkled; seed one, testa shiny black.

Northern South America and introduced into Africa; a genus of 3 species.

Pollen grains single, subspheroidal, ca 23-29μ (E) × ca 23-29μ (P), 12-colpate, 4 at each pole and 4 perpendicular to the equator, colpi ca 6-9μ long, sometimes ± indistinct, exine ca 2-2.5μ in thickness, sexine ± equal to nexine and finely to very finely reticulated (Fig. 5).

Young specimens of *Hilleria*, i.e. those not in late flowering or fruit, can be confused with *Schindleria* H. Walter, especially that section of the latter genus which turns black upon dessication. However, the pollen of the two genera, 12-colpate in *Hilleria*, and polyporate in *Schindleria*, provides a means for unmistakable identification.

a. Stamens 8-13; stigmas feathery, ± sessile ..... 1. *H. longifolia*
aa. Stamens ± 4; stigmas capitate.
  b. Style absent, stigma sessile ..... 2. *H. latifolia*
  bb. Style short, ca 0.2-0.3 mm long, stigma not sessile ..... 3. *H. secunda*

1. *Hilleria longifolia* (H. Walter) Heimerl, Oesterr. Bot. Zeitschr. **61**: 10, 1911.

H. latifolia (Lam.) H. Walter var. *longifolia* H. Walter, Pflanzenr. IV, 83 (Heft 39): 82, 1909. (Type *Poeppig 1541* W)

Herbs, erect, to 1-2.5 m. *Leaves* elliptic, ± long acuminate, entire, the bases obtuse, up to 23 cm long and 6 cm wide, glabrous above, coarsely hairy on veins beneath; petioles up to 6 cm long. *Inflorescences* up to 40 cm long, terminal or axillary. *Flowers* with pedicels to 6 mm long; bract single, up to 4 mm long;

bracteoles two, ca 0.2 mm long; sepals at maturity ca 3.5 mm long for lowermost, ca 3 mm long for remaining 3; stamens 8-13, irregularly deposited, the filaments ca 0.8-0.9 mm long, the anthers ca 1 mm; style absent, the stigma feathery. *Utricle* ca 2.5 mm in diam.

A rare species reported only from Peru and Bolivia.

Bolivia: sur yungas: Colaya, *Mexia 4302* (MO).

Peru: cuzco: Quincemil, *Marín 1536* (US). san martin: Margarita, *Ferreyra 1017* (US); vic of Tingo María, *Allard 22267* (US).

Pollen grains ca 23μ (E) × ca 23μ (P), colpi ca 8-9μ long, sexine medium finely reticulated.

Pollen examined: *Allard 22267* (US).

2. *Hilleria latifolia* (Lam.) H. Walter, Pflanzenr. IV, 83 (Heft 39): 81, 1909.

Rivina latifolia Lam., Encycl. Méth. Bot. **1**: 324, 1791. (Type *Martin s.n.* P)
R. affinis Nees & Mart., Nov. Acta Acad. Nat. Cur. **11**: 30, 1823.
Hilleria elastica Vell., Fl. Flumin. 47, **1**: *pl. 122*, 1825.
Rivina apetala Schum. & Thonn., Beskr. Guin. Pl. 84, 1827.
Mohlana nemoralis Mart., Nov. Gen. Sp. Pl. **3**: 171, *pl. 290*, 1829.
M. guineensis Moq. in DC., Prodr. **13**(2): 15, 1849. (Type *Schumann s.n.*, location unknown)
M. latifolia (Lam.) Moq., loc. cit. 16. (Type *Martin s.n.* P)
M. apetala (Schum. & Thonn.) Engler, Pflanzenwelt Ost-Afr. **5**: 175, 1895.

Herbs, slightly suffrutescent at the base, to ca 1 m. *Leaves* ovate to elliptic, acuminate to long acuminate, entire, the bases obtuse, up to 20 cm long and 6 cm wide, ± glabrous above, and coarsely hairy on the veins beneath; petioles to 8 cm long. *Inflorescences* up to 30 cm long, mostly axillary, rarely terminal. *Flowers* with pedicels up to 5 mm long; bract single, ca 2 mm long; bracteoles two, ca 0.2 mm long; sepals at maturity ca 4 mm long for lowermost, ca 3 mm long for remaining 3; stamens 4, alternate with the sepals, the filaments ca 0.8 mm long, the anthers ca 0.8 mm long; the style absent, the stigma capitate. *Utricle* ca 2 mm in diam.

South America and introduced into Africa.

Colombia: cundinamarca: Quebrada Cabana, *Killip et al.* 38373 (US).

Ecuador: guayas: Hacienda Barcelona Trail, *Gilmartin 555* (US).

Peru: cuzco: betw Victoria & Echarate, *Vargas 7555* (MO, US). huanuco: Pozuzo, *Macbride 4625* (US); Tingo María, *Asplund 12039* (US). junín: La Merced, *Soukup* 3373 (US). loreto: lower Río Huallaga, *Killip & Smith 28904* (US), *29079* (US). san martín: Rioja, *Woytkowski 6127* (US); Zepelacio nr Moyobamba, *Klug 3438* (MO, US).

Bolivia: beni: vic of Rurrenabaque, *Cárdenas 1771* (US). sara: Río Palometillas, *Steinbach 6799* (MO).

Paraguay: *Hassler 8287* (MO).

Argentina: salta: Río Blanco, *Venturi 7634* (US); vic of Tartagal, *West 8417* (MO).

Ivory Coast: *Leeuwenberg 4142* (MO); *Roberty 12376* (MO).

Ghana: *Darko 631* (MO); *Oldeman 757* (MO).

Nigeria: *Ross 153* (MO).

Cameroons: *Bates 673* (MO); *Staudt 922* (US); *Zenker 316* (MO, US), *4628* (MO); *Zenker & Staudt 15* (US).

Republic of Congo: *Corbisier 745* (MO); *Germain 229* (MO); *Louis 924* (MO), *7318* (MO, US), *11081* (MO), *11095* (MO).

Uganda: *Dummer 327* (US), *459* (MO, US).

Pollen grains ca 29μ (E) × ca 29μ (P), colpi 6-7μ long, sexine very finely reticulated (Fig. 5).

Pollen examined: *Bates 673* (MO); *Dummer 459* (US); *Louis 924* (MO); *Woytkowski 6127* (US).

Hilleria latifolia and *H. secunda* (Ruiz & Pavon) H. Walter are very difficult to distinguish. Frequently the styles are broken and what appears at first glance to be *H. latifolia* may be classifiable as *H. secunda* when a sufficient number of flowers is examined. Also, some specimens are almost undeterminable because of the intermediate character of the style length, which is difficult at best to observe because of its small size.

3. *Hilleria secunda* (Ruiz & Pavon) H. Walter, Pflanzenr. IV, 83 (Heft 39): 82, 1909.

Rivina secunda Ruiz & Pavon, Fl. Peru Chile **1**: 65, *pl. 102,* 1794. (Type *Ruiz & Pavon s.n.* K)
R. acuminata H.B.K., Nov. Gen. Sp. Pl. **2**: 184, 1817.
Mohlana secunda (Ruiz & Pavon) Mart., Nov. Gen. Sp. Pl. **3**: 172, 1829.
Rivina inaequalis Hook., Icon. Pl., *pl. 130,* 1837. (Type *Mathews 1604,* location unknown)
Mohlana secunda var. *acuminata* (H.B.K.) Moq. in DC., Prodr. **13**(2): 15, 1849.
Hillera secunda (Ruiz & Pavon) O. Ktze., Rev. Gen. Pl. **2**: 551, 1891.
Mohlana meziana H. Walter, Bot. Jahrb. **37**(Beibl. 85): 25, 1906. (Type *Ule 6500* B†, K)
Hilleria meziana H. Walter, Pflanzenr. IV, 83 (Heft 39): 83, 1909. (Type *Ule 6500* B†, K)

Herbs, slightly suffrutescent at the base, erect, to ca 1 m. *Leaves* ovate to elliptic, acute to acuminate, entire, the bases obuse, up to 15 cm long and 6 cm wide, coarsely hairy on the veins beneath; petioles to 6 cm long. *Inflorescences* up to 20 cm long, mostly axillary. *Flowers* with pedicels ca 5 mm long; bract single, ca 1.5 mm long, much overtopping the flowers in bud; bracteoles two, ca 0.2 mm long; sepals at maturity ca 3.5 mm long for lowermost, ca 2.25 mm long for remaining 3; stamens 4-7, alternate with the sepals, or ± deposited irregularly, the filaments ca 0.8-1 mm long, the anthers ca 1 mm long; style ca 0.2-0.3 mm long, the stigma capitate. *Utricle* ca 2 mm in diam.

Northern South America.

COLOMBIA: CUNDINAMARCA: Icononzo, *Pennell 2762* (MO, US); La Mesa, *Fernandez & Mora 1386* (US). TOLIMA: vic of Totare River, *Haught 2395* (A, US).

VENEZUELA: WITHOUT STATE: Quebrada de Chacaito, *Pittier 12996* (MO, US).

ECUADOR: GUAYAS: Manglar Alto, *Anthony & Tate 14* (US). MANABÍ: El Recreo, *Eggers 15513* (US); N of La Tuna, *Haught 3364* (US).

PERU: CAJAMARCA: Monte Seco: *Soukup 3866* (US). HUANUCO: Tingo María, *Asplund 12129* (US). JUNIN: La Merced, *Sandeman 5037* (US). LORETO: Tarapoto, *Ule 6500* (K). SAN MARTÍN: Alto Río Huallaga, *Williams 5757* (US), *6884* (US); Río Mayo, *Ferreyra 7813* (US); San Roque, *Williams 7611* (US); N of Tingo María, *Allard 20923* (US), *21822* (US).

BOLIVIA: BENÍ: San Buenaventura, *Williams 343* (US). LA CRUZ: s. loc., *Kuntze s.n.* (US).

Pollen grains ca 25μ (E) × ca 25μ (P), colpi ca 8-9μ long, exine ca 2μ in thickness, sexine finely reticulated.

Pollen examined: *Ferreyra 7813* (US); *Haught 2395* (US); *Williams 7611* (US).

10. LEDENBERGIA

Ledenbergia Klotzsch ex Moq. in DC., Prodr. **13**(2): 14, 1849. (Type *L. seguierioides* Klotzsch ex Moq.)

Ladenbergia O. Ktze., Rev. Gen. Pl. **2**: 550, 1891.
Flueckigera O. Ktze., loc. cit.

Trees or shrubs. *Leaves* alternate, elliptic to ± ovate, acuminate to acute, entire, the bases obtuse, glabrous to slightly pubescent; petiolate. *Inflorescences* racemes, mostly axillary, pendulous. *Flowers* perfect, or unisexual and plants dioecious, ± actinomorphic, pedicellate; bract single, awl-shaped, absent at anthesis; bracteoles two, minute, closely appressed to sepals; sepals 4, ± oblanceolate, constricted at the base, prominently veined, papery, green to brown; stamens 10-15, or 4-6 and rudimentary, deposited irregularly, or 4 alternate and 2 opposite; ovary present or absent, subglobose, compressed laterally, 1-carpellate, style absent, stigma penicellate. *Fruit* an utricle, subglobose, compressed laterally, ridged at the edges, pericarp wrinkled, papery brown; seed one, black.

Central America and Venezuela; a small genus of two species.

Pollen grains single, prolate spheroidal, ca 23-24μ (E) × ca 23-24μ (P), 12-colpate, 4 at each pole and 4 perpendicular to the equator, colpi ca 8-10μ long, exine ca 1.5-2.0μ in thickness, sexine ± equal to nexine and smooth to very finely reticulated.

Schmidt (1923) described a new species, *Ledenbergia peruviana*, based on *Weberbauer 6413*. I have seen a specimen of the type collection (GH), and hesitate to include it in *Ledenbergia* for the following reasons: its ± erect, paniculate inflorescences are in contrast to the pendulous racemes of *L. macrantha* Standley and *L. seguierioides* Klotszch, and the pollen is 3-colpate, in contrast to 12-colpate for the above mentioned species. Another collection, *Hutchison & Wright 3471* (MO), also from Peru, appears almost identical to *Weberbauer 6413* in floral and pollen morphology. For the present time, however, I am uncertain as to their inclusion in *Ledenbergia*, to which they are undoubtedly related.

a. Flowers perfect ..... 1. *L. seguierioides*
aa. Flowers unisexual, pistillate flowers appearing as perfect with 4-6 rudimentary stamens ..... 2. *L. macrantha*

1. *Ledenbergia seguierioides* Klotzsch ex Moq. in DC., Prodr. **13**(2): 14, 1849. (Syntypes: *Klotzsch 350* G; *Plie 20* P; *Vargas 296* G, P)

Rivina seguierioides Klotzsch ex Moq., loc. cit.
Flueckigera seguierodes (Klotzsch ex Moq.) O. Ktze., Rev. Gen. Pl. **2**: 551, 1891.

Shrubs or small trees, to 3.5 m. *Leaves* elliptic, acuminate, entire, the bases obtuse to slightly cordate, up to 16 cm long and 7 cm wide, glabrous or slightly pubescent on veins beneath; petioles 2-4(-8) cm long. *Inflorescences* racemes, up to 35 cm long, mostly axillary, softly pubescent, pendulous. *Flowers* perfect, with pedicels to 4 mm long; bract single, 1.2 mm long, awl-shaped; bracteoles two, ca 0.5 mm long; sepals ca 4(-6) mm long and 1.5-2 mm wide, green to yellow; stamens 12-14, irregularly deposited in one-two whorls, the filaments ca 2 mm long,

the anthers ca 1.2 mm long; ovary present, stigma profusely penicellate. *Utricle* ca 2 mm in diam.

Reported only from Venezuela.

VENEZUELA: BOLÍVAR: nr Las Trincheras, *Pittier 8884* (G, GH, US). FEDERAL: rd betw Caracas & La Guaira, *Aristequieta 2814* (US); *Tamayo 1490* (US). MÉRIDA: Colonia Tovar, *Fendler 1297* (GH), *2389* (GH). SUCRE: vic of quebrada tributary of Río Manzanares, *Steyermark 62767* (F). WITHOUT PROVINCE: *Curran & Hamman 1238* (GH, MO).

Pollen grains ca 24μ (E) × ca 24μ (P), colpi ca 9-10μ long.

Pollen examined: *Aristequieta 2814* (US); *Fendler 2389* (GH); *Tamayo 1490* (US).

2. *Ledenbergia macrantha* Standley, Jour. Wash. Acad. Sci. **13:** 350, 1925. (Holotype *Calderon 680* US)

Trees, dioecious, to 12 m. *Leaves* ovate to elliptic, acuminate, entire, the bases obtuse to slightly oblique, up to 13 cm long and 6 cm wide, softly pubescent on veins beneath; petioles elongated, 7-10 cm long. *Inflorescences* racemes, the staminate ca 10 cm long, the pistillate 15-25 cm long and pendulous, mostly axillary, the peduncle softly pubescent. *Staminate flowers* with pedicels ca 5 mm long; bract single, ca 1 mm long, triangular, brown, papery; bracteoles two, ca 0.8 mm long; sepals 4, ± equal, ca 3-4 mm long and 1.5-3 mm wide; stamens 15-20, the filaments ca 0.8-1 mm long, the anthers ca 0.8-0.9 mm long; ovary absent. *Pistillate flowers* with pedicels ca 8 mm long; bract single, ca 2 mm long, brown, papery, deciduous; bracteoles two, ca 1.2 mm long, papery; sepals 4, ± equal, 8-10 mm long and 4-5 mm wide, conspicuously net veined, green to yellow; stamens 4-6, rudimentary, alternate with the sepals or 4 alternate and 2 opposite, the filaments very short, the anthers ca 0.5 mm long; ovary subglobose, compressed laterally, style absent, stigma papillose. *Utricle* ca 2.5-2.8 mm in diam.

Central America.

MEXICO: JALISCO: *Rzedowski 21872* (F), *21873* (F).
GUATEMALA: *Steyermark 52148* (F).
EL SALVADOR: *Allen & Armour 6802* (MO); La Libertad, Puerta de la Laguna, *Calderon 680* (NY, US); *Standley 23656* (F, MO, US); *Padilla 195* (MO).

Pollen grains ca 23μ (E) × ca 23μ (P), colpi ca 8-9μ long. [Very rarely 15-colpate, grains then ca 30μ (E) × ca 30μ (P), colpi ca 7-8μ long.]

Pollen examined: *Rzedowski 21873* (F).

Originally described with perfect flowers, the specimens collected by Rzedowski definitely are otherwise. Upon close examination of other specimens the occasional flowers appearing as perfect can be seen to have only much reduced and rudimentary stamens. However, it is unusual that so few specimens of the male plant have been collected (*Rzedowski 21873* F is the only one I have seen); it must be very rare.

11. PETIVERIA

Petiveria L., Sp. Pl. 342, 1753. (Type *P. alliacea* L.)

Mapa Vell., Fl. Flumin. 59, 1825.

Monotypic.

1. *Petiveria alliacea* L., Sp. Pl. 342, 1753. (Type LINN, not seen; from IDC Micro-Edition 472.1)

P. octandra L., Sp. Pl. ed. 2, 486, 1762. (Type LINN, not seen; from IDC Micro-Edition 472.2)
P. foetida Salisb., Prodr. 214, 1796.
Mapa graveolens Vell, Fl. Flumin. 59, *pl. 153*, 1825.
Petiveria alliacea var. *grandifolia* Moq. in DC., Prodr. **13**(2): 9, 1849. (Type *Michaux s.n.* G, not seen, in IDC Micro-Edition, Candolle Prodromi Herbarium)
P. alliacea var. *octandra* (L.) Moq., loc. cit. 1849. (Syntypes: *Ledru s.n.* G; *Sagra 399* G, both not seen, in IDC Micro-Edition, Candolle Prodromi Herbarium)
P. ochroleuca Moq., loc. cit. 1849. (Type *Mociño & Sessé s.n.*, location unknown)
P. paraguayensis Parodi, Anal. Soc. Cient. Argent. **5**: 160, 1878.
P. hexandria Sessé & Moc., Fl. Mexic. ed. 2, 90, 1894.
P. corrientina Rojas, Bull. Geogr. Bot. **28**: 163, 1918.
P. graveolens (Vell.) Stellfeld, Trib. Farm. Bras. **12**: 114, 1944.

Herbs, slightly woody at the base, sparsely branched, to 2 m. *Leaves* elliptic to ovate, mucronate to acute, entire, the bases narrowed to obtuse, up to 20 cm long and 6 cm wide, ± glabrous; petioles to 1 cm long. *Inflorescences* spike-like racemes, up to 40 cm long, peduncle sparsely pubescent to ± glabrous, somewhat lax. *Flowers* ± sessile or with pedicels 2-3 mm long; bract single, ca 1.5 mm long, triangular; bracteoles two, < 1 mm long; sepals 4, ± equal, oblong, ca 4 mm long, 3 veined, persistent in fruit; stamens 4, 6 or 8, alternate or deposited irregularly, the filaments ca 2-3 mm long, the anthers ca 1.5-2 mm long; ovary 1-carpellate, flattened, 4-6 uncinate, style absent, stigma papillose and on one flattened side of ovary only. *Fruit* an achene, flattened, elongated, 4-6 hooked, green, up to 8 mm long; seed one, linear.

Widely distributed in the warmer regions of the New World.

Pollen grains subspheroidal, ca 23-28μ (E) × ca 23-28μ (P), 12 colpate or sometimes 15 colpate, with 4(-5) at each pole and 4(-5) perpendicular to the equator, colpi ca 5-7μ long, exine ca 1.7-1.9μ in thickness, sexine ± equal to nexine and finely reticulated.

Some samples of pollen, mostly from *Petiveria alliacea* L. var. *tetrandra* (Gomez) Nowicke, had pollen which appeared acolpate, indicating possible partial sterility of this group, notwithstanding the setting of fruit.

a. Fruits 4-hooked .....1a. *P. alliacea* var. *alliacea*
aa. Fruits 5- or 6-hooked .....1b. *P. alliacea var. tetrandra*

1a. *Petiveria alliacea* L. var. *alliacea.*

United States: florida: *Chapman s.n.* (MO); *Curtiss 2339* (MO), *5520* (MO); *Garber 23* (MO); *Miller s.n.* (MO); *Moldenke 723* (MO), *727a* (MO).

Mexico: chiapas: *Matuda 139* (MO). guerrero: *Hinton 10850* (MO). michoacán: *Hinton 12300* (MO). sinaloa: *Gentry 4965* (MO); *Mexia 305* (MO). vera cruz: *Purpus 2272* (MO). yucatán: *Gaumer et al. 23418* (MO); *Steere 1074* (MO). without state: *Orcutt 5338* (MO).

British Honduras: *Gentle 4953* (MO); *Schipp 426* (MO).

Honduras: *Molina 17* (MO); *Yuncker et al. 8194* (MO).

Guatemala: *Smith 4060* (MO).

Nicaragua: *Baker 159* (MO); *Greenman & Greenman 5718* (MO); *Wright s.n.* (MO).

Panama: *Allen 940* (MO), *1291* (MO); *Blum & Tyson 1001* (MO); *Duke 3853* (MO), *3976* (MO), *4146* (MO), *5086* (MO); *Dwyer 1770* (MO); *Ebinger 555* (MO); *Hunter & Allen 694* (MO), *731* (MO); *MacBride 2791* (MO); *Tyson 1425* (MO), *1477* (MO); *von Wedel 636* (MO), *1323* (MO); *White 308* (MO); *Woodson & Schery 841* (MO), *900* (MO); *Woodson et al. 1470* (MO).

COLOMBIA: CUNDINAMARCA: betw Fusagasuga & Pandí, *Pennell 2720* (MO); La Mesa, *Garcia 12163* (MO). MAGDALENA: Santa Marta, *Smith 440* (MO).

VENEZUELA: AMACURO: Pedernales, *Curran & Haman 1315* (MO). CARABOBO: betw Maracay & Valencia, *Williams 11031* (MO). SUCRE: Margarita I, *Millier & Johnston 13* (MO).

BRAZIL: AMAZONAS: Tres Casas, *Krukoff 6500* (MO).

ARGENTINA: FORMOSA: Laguna Vera, *Morel 4975* (MO); s. loc., *Jorgensen 3074* (MO). MISSIONES: Puerto Viejo, *Schwarz 2294* (MO); San Javier, *Schulz 7011* (MO); *Schwarz 3756* (MO). SALTA: Campo Quijano, *Venturi 8210* (MO).

PARAGUAY: WITHOUT PROVINCE: vic of Pilcomayo River *Morong 948* (MO); Ypacaray, *Hassler 12112* (MO). s. loc., *Hassler 3586* (MO); *Morong 530* (MO).

BOLIVIA: SARA: Buena Vista, *Steinbach 5124* (MO). WITHOUT PROVINCE: Yungas, *Bang 506* (MO); *Buchtien 743* (MO).

PERU: HUANUCO: Tingo María, *Woytkowski 5384* (MO). SAN MARTÍN: Juan Jui, *Klug 3833* (MO).

ECUADOR: MANABÍ: betw Chone & Santo Domingo, *Dodson & Thien 1758* (MO).

CUBA: *Britton et al. 14922* (MO); *Combs 182* (MO); *Curtiss 611* (MO); *Pollard & Palmer 322* (MO); *Rugel 66* (MO); *Van Hermann 232* (MO).

DOMINICAN REPUBLIC: *Allard 13920* (MO).

HAITI: *Eyerdam 123* (MO); *Leonard 8950* (MO); *Leonard & Leonard 11626* (MO).

GRENADA: *Broadway s.n.* (MO).

GUADELOUPE: *Duss 2983* (MO).

JAMAICA: *Crosby et al. 98* (MO); *Harris 11007* (MO); *Hitchcock s.n.* (MO).

MARTINIQUE: *Kohaut 98* (MO); *Sieber 98* (MO).

PUERTO RICO: *Heller 4487* (MO), *6179* (MO); *Holm 261* (MO); *Otero 318* (MO); *Sintensis 3079* (MO).

ST. CROIX: *Ricksecker 27* (MO); *Ricksecker 132* (MO).

TOBAGO: *Broadway 4690* (MO).

TRINIDAD: *Broadway 5168* (MO); *Sieber 115* (MO).

Pollen examined: *Blum & Tyson 1001* (MO); *Crosby et al. 98* (MO); *MacBride 2791* (MO).

1b. *Petiveria alliacea* L. var. **tetrandra** (Gomez) Nowicke, stat. nov.

P. tetrandra Gomez, Obs. Med. Bot. Pl. Bras. 13, 1803.

P. hexaglochin Fisch. & Meyer, Ind. Sem. Hort. Petrop. 35, 1835; Linnaea **10**(Litt. Ber.): 99, 1836.

BRAZIL: CANOAS: s. loc., *Luis 8* (F). PARANÁ: s. loc., *Dusen 16339* (NY); *Fiebrig 5867* (F). WITHOUT PROVINCE: *Jorgensen 3908* (F).

Pollen grains in both samples appeared acolpate.

Pollen examined: *Fiebrig 5867* (F); *Luis 8* (F).

12. MONOCOCCUS

Monococcus F. Muell., Fragm. **1:** 46, 1858. (Type *M. echinophorus* F. Muell.)

Monotypic.

1. *Monococcus echinophorus* F. Muell., Fragm. **1:** 46, 1858. (Type *Hill & Mueller s.n.* location unknown, but *Mueller s.n.* K)

Shrubs, dioecious or monoecious, subscandent to climbing. *Leaves* lanceolate-ovate, acute, uneven to finely undulate, the bases obtuse, up to 8 cm long and 3 cm wide, ± pubescent, more so on the veins beneath; petioles to ca 1 cm long. *Inflorescences* spike-like racemes, up to 15 cm long, mostly terminal, pistillate or staminate, or rarely both and the staminate flowers terminal. *Staminate flowers* with pedicels to ca 2 mm long; bract single, ca 2-2.5 mm long, awl-shaped,

keeled; bracteoles two, ca 1-1.2 mm long; sepals 4, ± equal, ca 2-2.5 mm long, rounded; stamens 12-20, the filaments ca 2.5-3 mm long, the anthers ca 1.5 mm long; ovary absent. *Pistillate flowers* sessile or with pedicels to 1.5 mm long; bract single, ca 1-1.5 mm long, lanceolate, keeled; bracteoles two, ca 1 mm long, closely appressed to sepals; sepals 4, ± equal, somewhat united at the base, lanceolate, ca 1.2-1.5 mm long; stamens absent; ovary obovoid, 1-carpellate, spinulose, the style from one side, short, curved, the stigma profusely papillose. *Fruit* an utricle or achene (?), flattened, spinulose, spines recurved at the tip, up to 3 mm long; seed one.

Australia, New Caledonia, and New Hebrides.

Australia: new south wales: *Cunningham 191* (BM, MO). queensland: *Bailey 214* (*MO*), *s.n.* (US); *Dietrich s.n.* (US); *Mueller s.n.* (BM, K, MO); *White 6580* (K).
New Caledonia: *Vieillard 3075* (BM).
New Hebrides: *Baker 163* (BM).

Pollen grains single, subspheroidal, ca 23μ (E) × ca 23μ (P), 7-11 pantoporate, the ora ca 3-3.5μ in diam, exine ca 1-1.5μ in thickness, the sexine ± equal to nexine and ± smooth.

Pollen examined: *Dietrich s.n.* (US).

MICROTEOIDEAE

III. Subf. **Microteoideae** Eckardt ex Nowicke, subf. nov. Ovarium unicarpellatum (?) stigmatitus 2-4, uniseminate; achenium. (Type *Microtea* Swartz)

a. Herbs; leaves not succulent, without calcium oxalate crystals; inflorescences spikes or racemes; flowers attached singly; stamens 5 or more, anthers globose; pollen pantoporate; S. America .....13. *Microtea*
aa. Wiry herbs; leaves ± succulent, with calcium oxalate crystals; inflorescences spikes; flowers attached in groups of ca three; stamens 4; anthers longer than broad; pollen 3-colpate; Africa .....14. *Lophiocarpus*

13. MICROTEA

Microtea Swartz, Prodr. **4:** 53, 1788. (Type *M. debilis* Swartz)

Schollera Rohr & Vahl, Skrivt. Naturh. Selsk. Kjoebenhavn **2:** 210, 1792.
Microthea Juss., Dict. **3:** 288, 1804.
Ancistrocarpus H.B.K., Nov. Gen. Sp. Pl. **2:** 186, *pl. 122*, 1817.
Potamophila Schrank, Pl. Rar. Horti. Monac. **2:** 62, 1819.
Ceratococa Willd. ex Roem. & Schult. in L., Syst. Veg. ed 15, **6:** 800, 1820.
Aphananthe Link, Enum. **1:** 383, 1821.

Herbs, slender, some species becoming suffrutescent at the base, erect or with branches descending or trailing, up to 60 cm, annuals. *Leaves* alternate or fasciculate, narrow-lanceolate, elliptic or deltoid, entire, the bases attenuate, obtuse or truncate; sessile or petiolate. *Inflorescences* spikes or spike-like racemes, terminal or axillary. *Flowers* perfect, actinomorphic, sessile or with pedicels to 5 mm long; bract single; bracteoles two, rarely absent; sepals 5, ± equal, one vein, dry and/or membranaceous, green to white; stamens 5-9, rarely 4, alternate with the sepals or irregularly placed, in some species appearing to be united into a ring at the base, the filaments of varying lengths, the anthers globose; ovary ± spherical, 1-carpellate (?), the styles absent or very abbreviated, the stigmas 2-4, filiform.

Fruit an achene, thin walled, muricate to spiny; seed one, spherical-lenticular, testa shiny black.

A genus of about 9 species well represented in the American tropics, particularly in South America. *Microtea scabrida* Urban has perhaps the most southerly distribution, being found in the northern provinces of Argentina.

Pollen grains single, subspheroidal, ca 17-23μ (E) × ca 17-23μ (P), pantoporate, (15-)20-25 apertures, ora ca 2-3μ in diam, exine ca 1.3-2μ in thickness, sexine ± equal to nexine and finely reticulated.

Microtea, as well as *Lophiocarpus* Turcz., with its minute, simplified flowers, scarious bracts and pollen type, represents a connecting link to the halophytic *Chenopodiaceae* and *Amaranthaceae.* The recognition of *Lophiocarpus* as distinct from *Microtea,* into which it had been incorporated by Brown (1909), is valid, based not only on a marked contrast in the pollen morphology, but on significant differences in the sporophyte generation as well. *Microtea* is distinguished from *Lophiocarpus* by its more herbaceous habit, strictly actinomorphic flowers which are singly attached, tendency to 5 stamens or more, globose anthers, and lack of calcium oxalate crystals or succulence in the leaves. The geographical distribution of the two groups, neotropics (*Microtea*) versus dry areas of southern Africa (*Lophiocarpus*), provides additional support for their separation as distinct genera.

Walter (1909) described the subg. *Schollera* containing the generic type, *M. debilis* Swartz, and one other species, *M. portoricensis* Urban, and subg. *Eumicrotea* to include the remaining species. In accordance with the Code, his subg. *Schollera* must become subg. *Microtea,* and his subg. *Eumicrotea* is renamed subg. *Moquinia.*

a. Inflorescences spikes less than 4 cm long; stamens (4-)5 .....subg. 1. *Microtea*
  b. Achenes wrinkled or muricate .....1. *M. portoricensis*
  bb. Achenes spiny .....2. *M. debilis*

aa. Inflorescences spikes or spike-like racemes greater than 4 cm long at maturity; stamens 6-9 .....subg. 2. *Moquinia*
  c. Flowers sessile or subsessile, pedicels < 1.5 mm long.
    d. One bract subtending each flower .....3. *M. longebracteata*
    dd. One bract and two smaller bracteoles subtending each flower.
      e. Leaf blades deltoid, petioles distinct .....4. *M. scabrida*
      ee. Leaf blades linear to lanceolate, the bases attenuate.
        f. Inflorescences delicate or filmy spikes; fruits ca 1 mm in diam; leaves thin and brittle when dry .....5. *M. paniculata*
        ff. Without the above combination of characters.
          g. Leaf blades narrowly lanceolate; fruits ca 1.5 mm in diam .....6. *M. sulcicaulis*
          gg. Leaf blades more variable; fruits ca 1.2 mm in diam ....7. *M. foliosa*
  cc. Flowers pedicellate, at least some pedicels 2 mm long.
    h. Plants suffrutescent at the base; leaves filiform, less than 2 mm wide and ca 1 cm long .....8. *M. tenuifolia*
    hh. Plants herbaceous; leaves lanceolate to elliptic, at least some greater than 5 mm wide and 3 cm long .....9. *M. maypurensis*

SUBG. 1 MICROTEA.

subg. *Schollera* (Rohr & Vahl) H. Walter, Pflanzenr. IV, 83 (Heft 39): 127, 1909.

1. *Microtea portoricensis* Urban, Ber. Deutsch. Bot. Ges. **3**(8): 324, 1885. (Type *Sintenis 717* NY, S)

Herbs, slender, trailing, primary stems abbreviated. *Leaves* at the base spatulate, appearing in some to form a basal rosette, up to 5 cm long and 2 cm wide, stem leaves smaller, oblanceolate to obovate, acute to slightly mucronate, entire, the bases long attenuate. *Inflorescences* spikes, < 3 cm long, 15-30 flowers. *Flowers* ± sessile; bract single, ca 0.8 mm long, lanceolate; bracteoles absent; sepals (4-)5, ca 0.8 mm long, oblong, dry; stamens 5, occasionally 4; the stigmas 2. *Achene* ca 1 mm in diam, testa muricate or wrinkled.

The Greater Antilles.

Cuba: *Ekman 11495* (S), *13408* (NY, S); *Leon 2609* (NY), *4340* (NY); *Leon & Eduard 8717* (NY); *Rugels 771* (NY); *Van Hermann 121* (BM, NY).
Dominican Republic: *Ekman 15330* (S).
Haiti: *Eckman 7279* (S).
Puerto Rico: *Sintenis 717* (BM, NY, S)

Pollen grains ca 21μ (E) × ca 21μ (P), ca 20 apertures, exine ca 2μ in thickness.

Pollen examined: *Ekman 13408* (NY); *Bro. Leon 2609* (NY), *4340* (NY).

Although a sharp distinction between this species and the wider ranging *M. debilis* Swartz is difficult to maintain, the characters of the exocarp, wrinkled in *M. portoricensis* Urban and spinulose in *M. debilis,* and the length of the spike, shorter in *M. portoricensis,* are the most constant. However, Urban's original description of 3-4 stamens does not appear to be correct; three stamens were never observed and four only occasionally.

2. *Microtea debilis* Swartz, Prodr. **4:** 53, 1788. (Type *Swartz s.n.,* location unknown)

Schollera debilis Rohr, Skirvt. Naturh. Selsk. Kjorb. **2:** 210, 1792.
Microtea ovata Delile, Hort. Monsp., 1827.
M. debilis var. ovata (Delile) Moq. in DC., Prodr. **13**(2): 17, 1849.
M. debilis var. rhombifolia Moq., loc. cit.

Herbs, ± decumbent, stems prominently grooved, to 45 cm. *Leaves* very variable but generally oblanceolate to rhomboid, ± acute, entire, the bases long attenuate, up to 8 cm long and 3 cm wide. *Inflorescences* spikes, < 4 cm long, 10-20(-24) flowers. *Flowers* ± sessile; bract single, ca 1 mm long, thin, lanceolate; bracteoles absent; sepals oblong; stamens 5, the filaments ca 0.5 mm long, the anthers 0.1 mm long; stigmas 2. *Achene* spiny, ca 1 mm in diam, much overtopping the persistent calyx at maturity.

Neotropics.

British Honduras: *Gentle 1487* (MO); *Schipp S-286* (MO).
Honduras: *Thieme 5427* (NY); *Wilson 384* (NY); *Yuncker et al. 8374* (BM, MO, NY); *Robertson 5* (BM).
Guatemala: *Bernoulli 877* (NY); *Deam 6042* (MO, NY); *Kellerman 7477* (NY); *Pittier 386* (NY).
El Salvador: *Calderon 1069* (NY).
Costa Rica: *Boissier 8712* (NY); *Brenes 12242* (NY).
Panama: *Allen 883* (MO), *1296* (MO); *Duke 4023* (MO), *4054* (MO); *Fendler 109* (MO); *Heriberto 115* (NY); *Killip 3423* (NY); *Pittier 2709* (NY); *Stern et al. 808* (MO).

ANTIGUA: *Box 1005* (MO, NY).
DOMINICA: *Lloyd 402* (NY).
DOMINICAN REPUBLIC: *Howard & Howard 9731* (NY).
GRENADA: *Broadway s.n.* (NY).
GUADELOUPE: *Bertero 93* (MO); *Duss 2401* (NY).
HAITI: *Leonard & Leonard 11346* (NY).
JAMAICA: *Britton & Hollick 2013* (NY); *Harris 10214* (NY).
MARTINIQUE: *Duss 2063* (NY); *Hahn 811* (NY).
PUERTO RICO: *Britton & Cowell 1495* (NY); *Britton et al. 6650* (NY); *Shafer 2431* (NY).
ST. EUSTATIUS: *Boldingh 569B* (NY).
ST. KITTS: *Britton & Cowell 275* (NY).
ST. LUCIA: *Box 1999* (NY).
ST. THOMAS: *Britton et al. 470* (NY).
ST. VINCENT: *Smith & Smith 178* (NY).
TOBAGO: *Broadway 4642* (MO, NY); *Eggers 5826* (NY).
TRINIDAD: *Britton & Britton 2170* (NY); *Broadway 5455* (MO); *Fendler 643* (NY); *Kuntze 748* (NY).
BRAZIL: RIO NEGRO: vic of Barra, *Spruce s.n.* (NY).
COLOMBIA: ANTIOQUÍA: Vuelta de Acuna, *Pennell 3815* (MO, NY). BOLÍVAR: Arjona, *Killip & Smith 14525* (NY); *Turbaco, Killip & Smith 14359* (NY). MAGDALENA: Chiriguana, *Allen 72* (MO); Rincon Hondo, *Allen 504* (MO); Santa Marta, *Smith 1246* (MO, NY). META: Villavicencio, *Pennell 1567* (NY). VALLE: Cali, *Fosberg 20540* (NY).
VENEZUELA: LARA: betw Yaritagua & Duaca, *Saer 355* (NY); WITHOUT STATE: Cristóbal Colon, *Broadway 70* (NY).
GUYANA: *De La Cruz 1143* (NY), *2093* (MO, NY), *2480* (NY), *2501* (MO, NY), *3548* (NY), *3650* (MO, NY), *4033* (MO, NY); *Gleason 18* (NY), *696* (NY); *Jenman 5277* (NY); *Mell & Mell 234* (NY).
FRENCH GUIANA: *Broadway 222* (NY).
SURINAM: *Samuels 115* (NY).
ECUADOR: MILAGRO, *Hitchcock 20282* (NY); Naranjito, *Camp E 3575* (NY); Río Pita, *Asplund 5253* (NY).
PERU: LORETO: Río Paranapura, *Klug 3959* (MO); Yurimaguas, *Killip & Smith 28215* (NY).

Pollen grains ca 23μ (E) $\times$ ca 23μ (P), ca 20-25 apertures, exine ca 2μ in thickness.

Pollen examined: *Allen 504* (MO), *Duke 4054* (MO).

Microtea debilis is widely distributed in Central America, the lesser Antilles, the Dominican Republic and Haiti, and northern South America, but is conspicuously absent in collections from Cuba, where *M. portoricensis* appears semi-endemic, notwithstanding Roig & Acuna's (1951) reference to it in the Flora de Cuba. However, as I have indicated, the two species are closely related and may prove to be conspecific.

SUBG. 2 **Moquinia** Nowicke, nom. nov. (Type *Microtea paniculata* Moq.)
subg. *Eumicrotea* H. Walter, Pflanzenr. IV, 83 (Heft 39): 127, 1909.

3. *Microtea longebracteata* H. Walter, Pflanzenr. IV, 83 (Heft 39): 129, 1909.
(Type *Sellow* 359 photo NY from B†)

Herbs, erect, stems grooved, sparsely branched, to 30 cm. *Leaves* lanceolate to oblanceolate, acute, entire, the bases attenuate, up to 6 cm long and 1.5 cm wide. *Inflorescences* spikes, 12-15 cm long, 25-30 flowers. *Flowers* $\pm$ sessile or with minute pedicels $<$ 1 mm long; bract single, ca 1-1.2 mm long, lanceolate; bracteoles

absent; sepals ca 1 mm long; stamens ca 8, ± united into a ring at the base, the filaments ca 0.3 mm long, the anthers ca 0.1-0.2 mm long; stigmas 2, recurved. *Achenes* muricate, ca 0.8-1 mm in diam, overtopping the persistent calyx at maturity.

Brazil: paraiba: Areia, *de Moraes 974* (NY). pernambuco: Recife, *Pickel 3589* (NY).

Pollen grains ca 21μ (E) × ca 21μ (P), ca 15-aperturate, ora ca 2.5μ in diam, exine 1.5-2μ in thickness.

Pollen examined: *Pickel* 3589 (NY).

Microtea longebracteata is similar in general habit to *M. maypurensis* (H.B.K.) G. Don, but is easily distinguished by its sessile flowers and single bract.

4. *Microtea scabrida* Urban, Ber. Deutsch. Bot. Ges. **3**(8): 325, 1885. (Type *Sello s.n.* photo NY, from B†)

M. paniculata Moq. var. *latifolia* O. Ktze., Rev. Gen. Pl. **3**(2): 268, 1898.
M. scandens Rusby, Mem. N. Y. Bot. Gard. **7**: 239, 1927. (Type *Cardenas 1942* NY)

Herbs, erect, stems grooved, to 1 m. *Leaves* ± deltoid, acute-acuminate, entire, the bases truncate, up to 8 cm long and 4.5 cm wide; petioles to 2 cm long. *Inflorescences* spikes, ca 10-12 cm long, 30-40 flowers. *Flowers* ± sessile; bract single, ca 0.6 mm long; bracteoles two, ca 0.3 mm long; sepals ca 1.2 mm long, turning dark on dessication; stamens 8(-9), the filaments 0.7-0.8 mm long, the anthers ca 0.2 mm long; stigmas 2 and fimbriolate, or occasionally 3 by subdivision of one of original 2. *Achenes* sparsely spinulose, ca 1.8 mm in diam.

Northern Argentina and Bolivia, occasional from Brazil and Paraguay.

Brazil: paraná: Therezina, *Dusen 11265* (NY, S). pernambuco: Caxauga, *Ridley et al. s.n.* (BM). rio acre: São Francisco, *Ule 9361* (G).

Argentina: corrientes: Ita Ibate, *Schwarz 8262* (MO). misiones: Ora Verde, *Schwarz 7789* (G); Posadas, *Ekman 1976* (S); Puerto Piray, *Schwarz 6844* (NY); San Javier, *Schwarz 3754* (MO); Cerro San Pedro, *Schwarz 2892* (MO); Santa Ana, *Montes 1509* (MO).

Paraguay: Tobaty, *Hassler 6254* (S); s. loc., *Jorgensen 4008* (MO).

Bolivia: santa cruz: San Raphael, *Williams 222* (BM, NY); along Río Yapacani, *Kuntze s.n.* (NY), *Steinbach 7498* (BM, NY), without state: *Cardenas 1942* (NY).

Pollen grains ca 22μ (E) × 22μ (P), 17-20-aperturate, ora ca 2-2.5μ in diam, exine ca 2μ in thickness.

Pollen examined: *Montes 1509* (MO).

5. *Microtea paniculata* Moq. in DC., Prodr. **13**(2): 18, 1849. (Lectotype selected: *Blanchet 2709* K)

M. celosioides Moq. in DC., loc cit. (*Salzmann 472*, photo NY, from G)
Chenopodium paniculatum Salzm. ex Moq. in DC., loc cit., nom. nud. pro syn. *M. paniculata.*

Herbs, erect, stems grooved, to 45 cm. *Leaves* narrow-lanceolate to lanceolate, acuminate, entire, the bases attenuate, up to 4 cm long and 1 cm wide; ± sessile. *Inflorescences* spikes, ca 9-10 cm long, slender, 20-25 flowers. *Flowers* ± sessile; bract single, 1-1.2 mm long; bracteoles two, ca 0.5 mm long; sepals ca 1-1.2 mm long; stamens 8, the filaments ca 0.3 mm long, the anthers ca 0.2 mm long; stigmas 2 or 3. *Achene* spiny, ca 1 mm in diam, overtopping the persistent calyx at maturity.

Brazil and Paraguay.

BRAZIL: BAHIA: Brasilia, *Irwin et al.* 9600 (MO); *Lützelburg 730* (NY); Paranoa, *Irwin et al. 11258* (MO). WITHOUT STATE: *Gardner 1138* (BM, G, NY), *Glaziou 11440* (MO).

PARAGUAY: s. loc., *Hassler 3981* (NY), *6407* (MO, NY), *Jorgensen 4009* (MO, NY).

Pollen grains ca 18μ (E) × ca 18μ (P), ca 15 apertures, ora ca 2.5-3μ in diam, exine ca 2μ in thickness.

Pollen examined: *Hassler 6407* (MO).

6. *Microtea sulcicaulis* Chodat, Bull. Herb. Boiss., sér. 2, **3:** 1903. (Type: *Hassler 4238* F, K, NY)

Herbs, robust, stems grooved, to 45 cm. *Leaves* narrow-lanceolate to lanceolate-elliptic, acuminate to ± mucronate, entire, the bases attenuate, up to 7 cm long and 0.5-1.3 cm wide. *Inflorescences* spikes, 12-15 cm long, 40-50 flowers. *Flowers* ± sessile; bract single, ca 0.8 mm long; bracteoles two, minute, 0.1 mm long; sepals ca 1.2 mm long; stamens 8, appearing in some to be united into a ring at the base, the filaments ca 0.8 mm long, the anthers 0.2 mm long; stigmas 2. *Achene* spiny, ca 1.5 mm in diam, much overtopping the persistent calyx at maturity.

PARAGUAY: AMAMBAY: s. loc., *Hassler 9879* (G). YERBALES: Montium, *Hassler 4328* (F, NY). IPACARAY: s. loc., *Hassler 12395* (F, MO, NY, US).

Pollen grains ca 21μ (E) × ca 21μ (P), ca 15-aperturate, ora ca 2.5-3μ in diam, exine ca 2μ in thickness.

Pollen examined: *Hassler 12395* (US).

7. *Microtea foliosa* Chodat, Bull. Herb. Boiss., pér. 2, **3:** 418, 1903, emend. Nowicke. (Lectotype selected: *Hassler 7605* MO; isolectotypes F, G, NY, S)

Herbs, erect, stems grooved, to 40 cm. *Leaves* mostly lanceolate, mucronate, entire, the bases attenuate, up to 4 cm long and 1 cm wide; sessile or petioles to ca 8 mm long. *Inflorescences* spikes, 12-15 cm long, slender, 30-40 flowers. *Flowers* subtended by single bract, ca 0.8 mm long; bracteoles two, ca 0.2 mm long; sepals ca 0.9-1 mm long, prominently one-nerved; stamens 8, the filaments ca 0.5 mm long, the anthers ca 0.2 mm long; stigmas 2, spatulate. *Achenes* spiny, ca 1.2 mm in diam, overtopping the persistent calyx at maturity.

PARAGUAY: CONCEPCIÓN: Concepción, *Hassler 7605* (F, MO, NY, S).

Pollen grains ca 17μ (E) × ca 17μ (P), ± 15-aperturate, ora ca 2μ in diam, not well defined, exine ca 2μ in thickness.

Pollen examined: *Hassler 7605* (MO).

Sometimes difficult to separate from *M. paniculata* and *M. sulcicaulis, M. foliosa* differs from *M. paniculata* in its more robust habit, sturdy spikes and wider leaves, and from *M. sulcicaulis* in its smaller fruit size and shorter leaf length.

Chodat's exsiccatae (1903) of *Microtea foliosa* includes *Hassler 6254* and *7605*. Walter (1909) reduces *M. foliosa* to synonomy with *Microtea scabrida* Urban and cites both of the above collections. However, only *Hassler 6254* is a bona fide specimen of *M. scabrida*; *Hassler 7605* (MO) has been selected as the lectotype for an amended description of *M. foliosa.*

8. *Microtea tenuifolia* Moq. in DC., Prodr. **13**(2): 18, 1849. (Lectotype selected: *Claussen* 392 P)

Herbs, erect, much branched, ± suffrutescent at the base, to 25 cm. *Leaves* filiform, up to 1 cm long and 1 mm wide, curling when dry. *Inflorescences* spike-like racemes, ca 8-10 cm long. *Flowers* with pedicels to 2 mm long; bract single, ca 0.6 mm long; bracteoles two, ca 0.2 mm long; sepals ca 0.6-0.8 mm long; stamens 8, the filaments 0.6 mm long, the anthers ca 0.2 mm long; stigmas 2(-3). *Achene* spiny, ca 1 mm in diam, much overtopping the persistent calyx at maturity.

Brazil: minas geraes: Caldas, *Regnell II:11* (NY, US); vic of Lagoa Seca, *Williams 5447* (MO, US); Pico d'Habira, *Claussen 4* (P), *392* (P); Turvo, *Hoehne & Gehrt 17464* (NY); s. loc., *Riedel 48* (P).

Pollen grains ca 18μ (E) × ca 18μ (P), 17-20 apertures, ora ca 2μ in diam, exine ca 1.5-2μ in thickness.

Pollen examined: *Williams 5447* (MO).

The suffrutescent, much branched habit and very small, filiform leaves make this the most distinct species of *Microtea.*

9. *Microtea maypurensis* (H.B.K.) G. Don, Loud. Hort. Brit. ed. 2, 98, n. 6423, 1839.

Ancistrocarpus maypurensis H.B.K., Nov. Gen. Sp. Pl. **2**: 186, *pl. 122* 1817.
Galenia celosioides Spreng., Nov. Prov. Hort. Hal. 38, 1819.
Potamophila parviflora Schrank, Pl. Rar. Horti Monac. **2**: 63, 1819.
Ceratococca maypurensis (H.B.K.) Willd. ex Schult. in L., Syst. Veg. ed. 15, **6**: 800, 1820.
Aphananthe celosiodes Link, Enum. Hort. Berol. **1**: 383, 1821.
Ancistrocarpus schrankii Lebdeb., Ind. Sem. Hort. Dorp., 1822.
Microtea lanceolata Del., Hort. Monsp., 1827.
M. glochidiata Moq. in DC., Prodr. **13**(2): 18, 1849. (Syntypes: *Blanchet 2680* G, P; *Gardner 2311* K)
M. sprengelii Moq., loc cit. 19.
Ancistrocarpus hexander Gay ex Moq., loc. cit. 17, nom. nud. pro syn. (Type *Gay s.n.* P)

Herbs, stems grooved, moderately branched, erect, to 40 cm. *Leaves* lanceolate, acute to acuminate, entire, the bases attenuate, up to 5 cm long and 1 cm wide. *Inflorescences* spike-like racemes, ca 8-10 cm long. *Flowers* with pedicels to 5 mm long; bract single, ca 0.8-1 mm long; bracteoles two, ca 0.4 mm long; sepals ca 1.2 mm long; stamens 8, the filaments ca 0.5 mm long, the anthers ca 0.1 mm long; stigmas 2, or 4 by subdivision. *Achene* spiny, each spine having 3-5 hairs at the tip, ca 1-1.4 mm in diam, much overtopping the persistent calyx at maturity.

Brazil, Bolivia and Paraguay.

Brazil: amazonas: Rio Uaupes, *Spruce 2546* (NY). bahia: *Blanchet 2680* (G), *s.n.* (NY). ceará: Brasilia, *Lofgren 175* (S). rio grande do sul: Tapera, *Pickel s.n.* (NY). s. loc.: *Martius 428* (MO, NY).

Paraguay: s. loc., *Jorgensen 3846* (NY); *Hassler 3126* (NY, S).

Bolivia: beni: Beni River, *Rusby 1379* (BM, MO, NY). la paz: Tipuani, *Buchtien 7290* (MO, NY). without state: vic of Guanai, *Bang 1589* (BM, NY). s. loc., *Williams 369* (NY).

Pollen grains ca 21μ (E) × ca 21μ (P), 20-25 apertures, ora ca 2-2.5μ in diam, exine ca 2μ in thickness (Fig. 6).

Pollen examined: *Buchtien 7290* (MO).

14. LOPHIOCARPUS

Lophiocarpus Turcz., Bull. Soc. Nat. Hist. Moscou **16:** 56, 1843. (Type *L. polystachyus* Turcz.)

Wallinia Moq. in DC., Prodr. **13**(2): 143, 1849.

Herbs, in some species markedly suffrutescent at the base, sparsely or profusely branched, annuals. *Leaves* alternate or fasciculate, filiform or linear, sometimes ± succulent, calcium oxalate crystals present; sessile. *Inflorescences* spikes, mostly terminal, rarely axillary, flowers in clusters of (2-)3. *Flowers* perfect, ± actinomorphic; bract single, trilobed, the central lobe largest, the bract of the central flower largest; sepals 5, ± equal, thin, membranaceous; stamens 4, 3 alternate and one opposite, the filaments short, the anthers longer than broad; ovary spherical, 1-carpellate(?), style short, the stigmas 4, filiform. *Fruit* an achene, muricate, warty, or ridged; seed one.

South West Africa and South Africa; a small genus of 3 species characteristic of dry, sandy habitats.

Pollen grains single, subprolate, ca 16-23μ (E) × ca 20-27μ (P), 3-colpate, colpi ca 16-17μ long and ca 1μ wide at mid-length, exine ca 1.7-2.9μ in thickness, sexine equal to or slightly thicker than nexine and very finely reticulated (Fig. 8).

a. Delicate herbs; some inflorescences small and lateral; achenes weakly 16-ribbed ..... 1. *L. dinteri*

aa. Without the above combination of characters.

b. Achenes ribbed, or sometimes muricate and ribbed ..... 2. *L. polystachyus*

bb. Achenes warty to muricate, but not ribbed ..... 3. *L. tenuissimus*

1. *Lophiocarpus dinteri* Engl. in Engl. & Drude, Veg. Erde **9**(3): 138, 1915. (Neotype selected: *Dinter* 6885 PRE)

Herbs delicate, to 40 cm. *Leaves* alternate to slightly fasciculate, filiform, up to 3.5 cm long and 1 mm wide. *Inflorescences* spikes to 30 cm long, mostly terminal but some smaller lateral ones, very slender. *Flowers* subtended by a trilobed bract, ca 0.7 mm long for central flower, ca 0.4-0.5 mm long for two lateral flowers; sepals ± lanceolate, ca 0.8 mm long; filaments ca 0.8-0.9 mm long, the anthers ca 0.4 mm long; stigmas free to base. *Achenes* weakly 16-ribbed, ca 0.6-0.7 mm in diam.

South West Africa: Karibib, *Dinter* 6885 (BM, K, PRE); *Hardy 2061* (PRE).

Pollen grains ca 16μ (E) × 20μ (P), colpi ca 16μ long, very narrow, exine ca 1.7μ in thickness.

Pollen examined: *Dinter* 6885 (PRE).

2. *Lophiocarpus polystachyus* Turcz., Bull. Soc. Nat. Hist. Moscou **16:** 56, 1843. (Type *Drège 2940* K, PRE)

Wallinia polystachya (Turcz.) Moq. in DC., Prodr. **13**(2): 143, 1849.
Lophiocarpus burchellii Hook. f. in Benth. & Hook. f., Gen. Pl. **3:** 50, 1883. (Type *Burchell 1934* K)
Microtea burchellii (Hook. f.) N.E.Br., Kew Bull. **1909:** 135, 1909.
M. polystachya (Turcz.) N.E.Br., loc. cit.
M. gracilis A. W. Hill, Kew Bull. **1910:** 56, 1910. (Type *Schlechter 11806* K, PRE)
Lophiocarpus gracilis (A. W. Hill) Engl. in Engl. & Drude, Veg. Erde **9:** 138, 1915.

Herbs, in some markedly suffrutescent at the base, to 40 cm, moderately to profusely branched. *Leaves* alternate to fasciculate, filiform to linear, in some slightly succulent, up to 3 cm long and 2 mm wide. *Inflorescences* spikes, to 25 cm long, terminal, and 50-70 flower clusters. *Flowers* subtended by a trilobed bract, ca 1.2 mm long for central flower, ca 0.9-1 mm long for two lateral flowers; sepals slightly unequal, 1.2-1.5 mm long; filaments 1.2 mm long, the anthers ca 0.6 mm long. *Achenes* ribbed, sometimes muricate between the ridges, ca 1.5 mm in diam.

South Africa and South West Africa.

SOUTH AFRICA: CAPE OF GOOD HOPE: Barkley West, *Acocks 168* (PRE); Kalahari-Gemsbok Park, *Barnard 761* (PRE); Kenhardt, *Acocks 12632* (PRE); Prieska, *Bryant 909* (PRE); Springbok, *Hardy 1710* (PRE); Upington, *Theron 759* (PRE); Vryburg, *Burtt-Davy s.n.* (PRE), *Mogg 8132* (PRE); Warrenton, *Leistner 1252* (PRE); s. loc., *Acocks H1311* (PRE), *Marloth 1426* (PRE). TRANSVAAL: Kimberly, *Wilman 20234* (PRE); Lydenburg, *Storey 4064* (PRE). WITHOUT STATE: Asbestos Mts, *Marloth 2070* (PRE).

SOUTH WEST AFRICA: Gobabis, *Codd* 5833 (PRE), *de Winter 2468* (PRE), *Schlieben 10395* (PRE); Kaoko Veld Reserve, *de Winter & Leistner* 5786 (PRE); Keetmanshoop, *Liebenberg 5187* (PRE), Klein Karas, *Ortendahl 79* (PRE); Luderitz, *Kinges 2654* (PRE), *Merxmuller & Giess 3370* (PRE); Okambahe, *Liebenberg* 5043 (PRE); Omaruru, *de Winter 3156* (PRE); Rehoboth, *Basson* 37 (PRE); Spitzhopje, *Boss s.n.* (PRE); Windhoek, *Merxmuller 1003* (PRE).

WITHOUT LOCATION: *Holub s.n.* (PRE).

Pollen grains ca 23μ (E) × ca 27μ (P), colpi ca 17μ long, exine ca 2.9μ in thickness (Fig. 8).

Pollen examined: *Ortendahl 79* (PRE); *Liebenberg* 5043 (PRE), *5187* (PRE); *Schlieben 10395* (PRE).

Although a range of variation does exist in general habit, *Lophiocarpus burchellii* Hook. f. has been reduced to synonomy with *L. polystachyus* Turcz., since no specific character or set of characters consistently separates the two. Hill (1912) used the condition of the fruit wall, smooth in *L. polystachyus* and ribbed in *L. burchellii*, in attempting to validate separate specific status. However, all sheets examined, which had fruits, were ribbed to a greater or lesser degree, including the type for *L. polystachyus, Drège 2940* (PRE). Heimerl (1934) appears to agree with this conspecific treatment, as he states that the above species are scarcely separate from one another.

3. *Lophiocarpus tenuissimus* Hook. f., Ic. Pl. 1463, 1884. (Type *Rehman 4018* K)
Microtea tenuissima (Hook. f.) N.E.Br., Kew Bull. **1909**: 146, 1909.

Herbs slender, becoming suffrutescent at the base, to 25(-30) cm, sparsely branched. *Leaves* alternate or fasciculate, filiform, up to 2.5 cm long and 1 mm wide. *Inflorescences* spikes, to 15(-20) cm long, terminal, and 30-40 flower clusters. *Flowers* subtended by a trilobed bract, ca 0.8 mm long for central flower, ca 0.4 mm long for two lateral flowers; sepals lanceolate, ca 1 mm long; filaments ca 0.8 mm long, the anthers ca 0.5 mm long. *Achenes* muricate to warty, ca 1.2 mm in diam.

Southern Africa.

BECHUANALAND: vic of Kang, *Wild* 5035 (MO); Okavango Terr, *de Winter* 4422 (PRE); s. loc., *Harbor* 6553 (PRE).

SOUTH AFRICA: CAPE OF GOOD HOPE: Prieska, *Bryant* 5234 (MO); Vryburg, *Mostert 1250* (PRE). TRANSVAAL: Louis Trichardt, *Schlieben & Strey 8381* (PRE); Middleburg, *Hewitt*

10437 (PRE); Pietersburg, *Bolus 11010* (PRE); Rustenburg, *Codd 2670* (PRE); Silverton, *Obermeyer & van Nowhuys 27698* (PRE); Warmbad, *Leenderter 6269* (PRE); Witbank, *Repton 1211* (PRE); s. loc., *Schlechter 2336* (PRE), *Sidey 1425* (PRE).

SOUTHERN RHODESIA: Beitbridge, *Wild 5329* (MO); Nuanetsi, *Drummond 7748* (PRE); Wonderbloom Reserve, *Repton 1633* (PRE), *Smith 6195* (PRE); s. loc., *Kirk 47* (PRE).

SOUTH WEST AFRICA: Grootfontein, *Schoenfelder S413* (PRE), *Wild & Drummond 6983* (PRE); Waterburg, *Galpin 515* (PRE).

Pollen grains ca 20μ (E) × ca 27μ (P), colpi ca 17μ long, exine ca 2.2μ in thickness.

Pollen examined: *Harbor 6553* (PRE), *Schlieben & Strey 8381* (PRE), *Wild 5035* (MO).

AGDESTIOIDEAE

IV. Subf. **Agdestioideae** Nowicke, subf. nov. Ovarium 3-4 carpellatum, stigmatibus 3-4, uniseminale. (Type *Agdestis* Moc. & Sessé)

Monogeneric.

15. AGDESTIS

Agdestis Moc. & Sessé in DC., Regni Veg. Syst. 1: 543, 1818. (Type *A. clematidea* Moc. & Sessé)

Monotypic.

1. *Agdestis clematidea* Moc. & Sessé in DC., Regni Veg. Syst. Nat. **1:** 543, 1818. (Type *Sessé & Mociño s.n.* MA, not seen)

A. teterrima De Not., Ind. Sem. Bot. Genuens 29, 1855.

Vines, semi-woody climbers. *Leaves* deltoid, mucronate, entire, the bases cordate, up to 5 cm long and 6 cm wide, ± glabrous, punctated by calcium oxalate crystals; petioles 2-3(-5) cm long. *Inflorescences* panicles, irregular, ca 12 cm long, terminal or axillary. *Flowers* perfect, actinomorphic; with pedicels 3-10 mm long; bract single, ca 1.2 mm long, variously placed; bracteoles two, minute, visible only in bud; sepals 4, ± equal, ca 4 mm long, yellow-green, net veined, enlarging to ca 8 mm in fruit and becoming brown, papery and translucent; stamens 15-20, irregularly deposited in a ring at the base, the filaments ca 3.2 mm long, filiform, the anthers ca 1 mm long; ovary semi-inferior, 4-carpellate, the style ca 0.5 mm long, the stigmas 4, papillose and recurved. *Fruit* an achene; seed one, by abortion of the other 3 ovules.

Mexico; reported also from Nicaragua and from southern Florida and parts of Texas (Heimerl, 1934).

MEXICO: COLIMA: *Worth et al. 8716* (MO). GUERRERO: *Mexia 8947* (MO). SAN LUIS POTOSÍ: *Palmer 50* (MO); *Pringle 3276* (BM, MO, US); *Purpus 5387* (MO). TAMAULIPAS: *Berlandier 2367* (MO); *Dressler 2278* (MO); *Palmer 420* (MO). VERA CRUZ: *Purpus 6004* (BM, MO).

Pollen grains single, subprolate, ca 23μ (E) × ca 27μ (P), 3-colpate, colpi ca 12-13μ long, exine ca 1.5μ in thickness, ca 2.5μ in thickness at the poles, sexine ± equal to nexine and finely reticulated.

Pollen examined: *Dressler 2278* (MO).

The habit, leaf shape and inferior ovary distinguish this genus readily from all other members of the *Phytolaccaceae*.

STEGNOSPERMOIDEAE

V. Subf. *Stegnospermoideae* H. Walter, Pflanzenr. IV, 83 (Heft 39): 122, 1909. (Type *Stegnosperma* Benth.)

Monogeneric.

16. STEGNOSPERMA

Stegnosperma Benth., Bot. Voy. Sulph. 17, *pl. 12*, 1844. (Type *S. halimifolium* Benth.)

Chlamydosperma A. Rich., Ess. Fl. Cuba **1**: 631, 1845.

Shrubs, sometimes vine-like or spreading. *Leaves* alternate, spatulate, elliptic or ovate-orbicular, acute, mucronate, or rounded, entire or ± lamellate, the bases obtuse, glabrous, some species ± leathery to slightly succulent, calcium oxalate crystals present; petiolate. *Inflorescences* racemes or few-flowered cymules. *Flowers* perfect, actinomorphic, with pedicels to 8 mm long; bract single, lanceolate, or elliptic and keeled; bracteoles two, smaller, lanceolate or elliptic and keeled; sepals 5, ± equal, elliptic to ovate, slightly united at the base; staminodia 5, elliptic to ovate, thin, adhering to the sepals; stamens 5, 8, or 10, the filaments widened at the base and united into a ring, the anthers 2× longer than broad; ovary spherical, 3-5 carpellate, style very short or absent, stigmas 3-5, recurved. *Fruit* a capsule, splitting by 3-5 seams; seeds 3-5, testa smooth, shiny, red-brown to ± black.

Mexico, south to Nicaragua and in the West Indies; a small genus of three species, easily distinguished from each other.

Pollen grains single, subspheroidal to subprolate, ca 28-31μ (E) × ca 30-35μ (P), 3-colpate, colpi ca 21-24μ long and ca 3.5μ wide at midlength, exine ca 3μ in thickness, ca 4.5-5μ in thickness at the poles, sexine ± equal to nexine and mediumly reticulated (Fig. 3).

Two important characteristics of the genus *Stegnosperma* are in marked contrast to the remaining *Phytolaccaceae:* presence of petaloid staminodia (often referred to as petals, the occasional presence of anthers indicates otherwise), and the compound ovary of 3-5 carpels, each of which generally forms a seed.

a. Inflorescences small axillary cymules ..... 1. *S. watsonii*
aa. Inflorescences racemes, 5-7 cm long.
  b. Stigmas 5, capsule splitting by 5 seams ..... 2. *S. halimifolium*
  bb. Stigmas 3-4, capsule splitting by 3-4 seams ..... 3. *S. cubense*

1. *Stegnosperma watsonii* D. J. Rogers, Ann. Missouri Bot. Gard. **36:** 475, 1949. (Holotype *Palmer 1226* MO)

Shrubs, spreading or vine-like, to 5 m. *Leaves* spatulate to elliptic, rounded, acute, or rarely mucronate, entire, the bases obtuse, up to 2.5 cm wide and 3.5 cm long, glabrous, slightly leathery; petioles to 4 mm long. *Inflorescences* cymules, mostly axillary, rarely terminal, (1-)3-8 flowered. *Flowers* with pedicels to 6 mm long; bract single, ca 1.2 mm long, elliptic and keeled; bracteoles two, ca 0.8 mm long, elliptic and keeled; sepals ca 5 mm long and ca 3 mm wide; staminodia ca 5 mm long and 3 mm wide, constricted at the base; stamens ca 10, the filaments ca 4 mm long, the anthers ca 1.5 mm long; ovary 5-carpellate, the stigmas 5. *Capsule* ca 5 mm in diam, splitting by 5 seams; seeds (4-)5, testa red-brown.

Restricted to Baja California and northwestern coastal regions of Mexico.

MEXICO: BAJA CALIFORNIA: *Wiggins 7681* (F, US). SINALOA: *Jones s.n.* (F). SONORA: *Coville 1646* (US); *Gentry 2195* (F, MO, US), *2975* (F, MO); *Goldman 399* (US); *Keck 4067* (US); *Palmer 1226* (MO); *Rose 1211* (US); *Rose et al. 12390* (US), *12566* (US), *13231* (US), *15047* (US); *Shreve 5992* (F); *Wiggins 6247* (US).

Pollen grains subspheroidal to subprolate, 29-31μ (E) $\times$ 30-33μ (P), colpi ca 21μ long, exine ca 3.5μ in thickness, thickened at poles to ca 5μ.

Pollen examined: *Gentry 2975* (MO).

2. *Stegnosperma halimifolium* Benth., Bot. Voy. Sulph. 17, *pl. 12*, 1844. (as *S. halimifolia*)

Shrubs, coarse, to 4 m. *Leaves* ovate, apiculate to $\pm$ mucronate, entire, the bases obtuse, up to 4 cm long and 2.5 cm wide, glabrous, somewhat succulent or leathery; petioles 2-6 mm long. *Inflorescences* racemes, 5-7 cm long, terminal, sometimes a smaller lateral raceme near the base of the primary one. *Flowers* subtended by a single bract, 1.6 mm long, lanceolate; bracteoles two, ca 1.4 mm long, lanceolate; sepals ca 4 mm long and 2.5 mm wide; stamens $\pm$ 10, the filaments ca 4 mm long, the anthers ca 1.5 mm long; ovary 5-carpellate, the stigmas 5. *Capsules* 5-7 mm in diam, splitting by 5 seams; seeds 5, red-brown.

A distribution similar to *S. watsonii;* Baja California and northwestern states of Mexico.

MEXICO: BAJA CALIFORNIA: *Carter et al. 2115, 2497* (MO); *Constance 3139* (MO); *Fisher s.n.* (MO), *Gentry 4032* (MO); *Johnston 3166* (MO), *3488* (MO); *Jones 27465* (MO), *24481* (MO); *Purpus s.n.* (MO); *Sharsmith & Sharsmith 1436* (MO); *Shreve 6973* (MO).

Pollen grains ca 29μ (E) $\times$ ca 34μ (P) and colpi ca 23μ long (Fig. 3).

Pollen examined: *Purpus s.n.* (MO).

3. *Stegnosperma cubense* A. Rich. in Sagra, Hist. Fis. Pol. Nat. Cuba, Part 2, Hist. Nat. **10:** 309, **12:** *pl. 44*, 1845.

Shrubs to 4 m. *Leaves* ovate to orbicular, mucronate to retuse, lamellate, the bases rounded or obtuse, up to 6 cm long and 3 cm wide, or up to 3.5 cm in diam, glabrous; petioles 6-8 mm long. *Inflorescences* racemes, 5-7(-10) cm long. *Flowers* subtended by a single bract, ca 1.6 mm long, lanceolate; bracteoles two, ca 0.8 mm long, lanceolate; sepals ca 3.7 mm long and 2 mm wide; stamens 5, 8, or 10, the filaments 4 mm long, the anthers 1.6 mm long; ovary 3(-4) carpellate, the stigmas 3(-4). *Capsules* ca 5 mm in diam, splitting by 3(-4) seams; seeds 1-2(-3), black.

Central America, north to Baja California and south to Nicaragua, and the West Indies.

MEXICO: CHIAPAS: *Morley 710* (MO). COLIMA: *Goldsmith 99* (MO). GUERRERO: *Hinton 5719* (MO). MICHOACÁN: *Hinton 12627* (MO); *Leavenworth & Hoogstraal 1394* (MO). OAXACA: *Orcutt 3307* (MO). SINALOA: *Lamb 465* (MO); *Mexia 152* (MO); *Ortega 7488* (MO). VERA CRUZ: *Purpus 8959* (MO), *13066* (MO).

NICARAGUA: *Baker 2065* (MO).

CUBA: *Wright 2027* (MO).

DOMINICAN REPUBLIC: *Bertero s.n.* (MO); *Howard 12507* (MO).

Pollen grains ca 28μ (E) $\times$ 35μ (P) and colpi ca 24μ long.

Pollen examined: *Purpus 8959* (MO).

BARBEUIOIDEAE

VI. Subf. **Barbeuioideae** Nowicke, subf. nov. Ovarium 2-carpellatum, carpellisque connatis, biseminale; capsula. (Type *Barbeuia* Du Petit-Thouars)

Monogeneric.

17. BARBEUIA

Barbeuia Du Petit-Thouars, Gen. Nov. Madagasc. 6, 1806. (Type *B. madagascariensis* Steud.)

Monotypic.

1. *Barbeuia madagascariensis* Steud., Nom. ed. 2, **1**: 186, 1841.

Lianas, branched, drying black. *Leaves* elliptic, acute, entire, the bases obtuse, up to 8.5 cm long and 4 cm wide, glabrous, somewhat leathery; petioles ca 1-1.5 cm long. *Inflorescences* axillary fascicles or cymes, 2-10 flowered, rarely 1. *Flowers* perfect, actinomorphic; with pedicels ca 2.5-4 cm long; bract single, ca 1-1.5 mm long; bracteoles absent; sepals 5, subequal, ovate, ca 4-4.5 mm long and ca 3 mm wide, ± leathery; stamens 20-25, inserted on a disc at the base of ovary, the filaments ca 2-2.2 mm long, the anthers ca 1.4 mm long; ovary globose, 2-carpellate, the style absent, the stigmas 2, somewhat flattened, the inner margin lightly papillose. *Fruit* a capsule, 2 loculed; seeds two.

Malagasy Republic: *Elliot 2748* (BM); *Guillot 25* (G); *Humbert 3324* (A); *Schlieben 8039* (BM, G, K).

Pollen grains single, subprolate, ca 21μ (E) × ca 25μ (P), 3-colporoidate, colpi ca 10-11μ long, exine ca 2-2.5μ in thickness, sexine ± equal to nexine and finely reticulated.

Pollen examined: *Guillot 25* (G).

The relationship of *Barbeuia* to the remaining *Phytolaccaeceae* is tenuous. The ovary structure with two functional united carpels and the striking inflorescence type are unique. According to Walter's (1909) description of the ovule, it appears to be characteristic of the *Centrospermae* and should remain in the order, and, while I am inclined to agree with Hutchinson's (1959) treatment of this species as a monotypic family, I think that until *Barbeuia* is treated monographically it should be regarded as an anomalous member of the *Phytolaccaceae*.

Species Excluded from Family

Hilleria subcordata Standley & Williams, Ceiba **3**: 199, 1953. (Type *León* 3488 US)

Discussion and Conclusion

This revision of the *Phytolaccaceae* does not change the familial limits as outlined by Heimerl in 1934. It does, however, change the intrafamilial categories and groupings as follows: the *Rivineae* now become the subf. *Rivinoideae* and contain two tribes, the *Seguierieae* and the *Rivineae*. The differences in fruit and inflorescence type between the two tribes are striking, and justify the recognition of the *Seguierieae*. The pollen, 3-colpate or 3-colporoidate in the *Seguierieae*, and

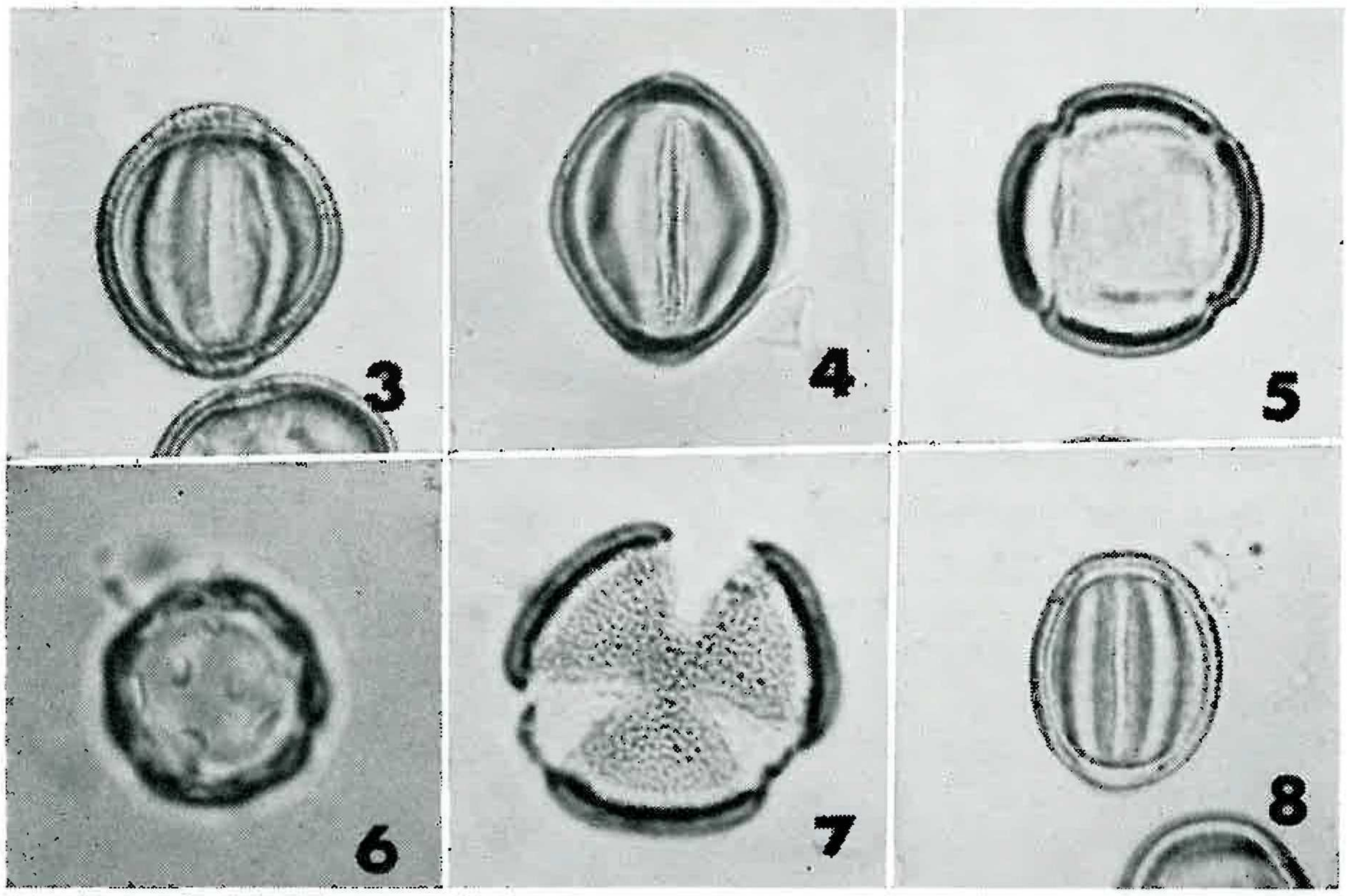

Fig. 3-8. Pollen in the *Phytolaccaceae*. Fig. 3 *Stegnosperma halimifolium* Benth., 3-colpate, equatorial view, ×680. Fig. 4 *Anisomeria littoralis* (Poepp. & Endl.) Moq., 3-colpate, equatorial view, ×700. Fig. 5 *Hilleria latifolia* (Lam.) H. Walter, 12-colpate, polar view, ×760. Fig. 6 *Microtea maypurensis* (H.B.K.) G. Don, pantoporate, ×850. Fig. 7 *Phytolacca rivinoides* Kunth & Bouché, 3-colpate, polar view, ×1000. Fig. 8 *Lophiocarpus polystachyus* Turcz., 3-colpate equatorial view, ×870.

Fig. 3 after *Purpus s.n.* (MO); Fig. 4 after *Grandjot s.n.* (MO); Fig. 5 after *Bates 673* (MO); Fig. 6 after *Buchtien 7290* (MO); Fig. 7 after *Frye & Frye 2548* (MO); Fig. 8 after *Liebenberg 5043* (PRE).

pantoporate, 12-colpate or 15-colpate in most of the *Rivineae*, also supports this distinction (Fig. 3-8).

All of Heimerl's tribal groups, *Barbeuieae*, *Phytolacceae* (*Euphytolacceae*), *Agdestideae*, and *Stegnospermeae*, now become monotribic subfamilies containing the same genera. The *Phytolaccoideae*, with their multiple, functional carpels as well as 3-colpate pollen, represent the base of the family and contain three closely related genera, *Anisomeria*, *Ercilla*, and *Phytolacca*, the first two having been placed within *Phytolacca* by various early authors. The *Agdestioideae*, with a unique semi-inferior ovary, well-defined cordate leaves and 3-4 stigmas, represent a distinct group, but the similarity between it and some genera in the *Rivineae*, i.e. *Ledenbergia*, cannot be denied. However, no clear morphological relationships exist for either the *Stegnospermoideae* or the *Barbeuioideae* to the remaining *Phytolaccaceae*, especially in the latter subfamily. In the case of the *Stegnospermoideae*, the general habit, inflorescence type, and absence of a true corolla are representative characters of most *Phytolaccaceae*, but the capsular fruit is not. The inclusion of the *Barbeuioideae in the Phytolaccaceae*, however, is difficult to justify. Its inflorescence type, ovary structure, and endemism to Madagascar, are all unique for the family. Its evidences of relationship to the other *Phytol-*

accaceae, i.e. lack of corolla, stamen number and attachment, and blackening on dessication, are all vague; certainly its 3-colporoidate pollen adds no evidence for a true connection within the family.

For *Microtea* and *Lophiocarpus* I follow Eckhardt (1964) and include these genera in the subf. *Microteoideae,* rather than treat them as anomalous genera as heretofore. The relationship between these two taxa may indeed prove to be superficial, but the relationship of the *Rivineae* to *Microtea,* e.g. general habit, geographical location, and pollen morphology, is certainly much closer than to *Lophiocarpus.* The connection of the *Phytolaccaceae* to the *Chenopodiaceae* and *Amaranthaceae* is best illustrated by *Lophiocarpus* with its tendency towards succulence, reduction in stamen number, scarious bracts, habitat, etc.

Within the family, even within genera, e.g. *Phytolacca,* there exists a wide variability, from primitive to somewhat advanced characters. The primitive features include: alternate, simple, entire leaves; ± simple inflorescence types; an absence of a corolla not due to reduction; actinomorphic and perfect flowers; a tendency to many stamens irregularly deposited; superior ovary placement; separate and many carpels; and 3-colpate pollen. The more advanced characters observable in some groups include: reduction of carpel and stamen numbers, and loss, either physical or functional, of the androecium or gynoecium, leading to a dioecious condition. More rarely, a tendency to zygomorphy and inferior ovary position are present. Many more genera have advanced pollen types, i.e. pantoporate, 12-colpate and 15-colpate, and chromosome data for the family indicate many polyploid genera. As might be expected, there is not necessarily a correlation between advanced pollen morphology and advanced floral morphology, nor is there a correlation between the different evidences of advanced floral morphology, e.g. *Anisomeria* exhibits a tendency towards zygomorphy but is primitive in most other floral characters. In conclusion I consider the floral morphology on the whole as moderately primitive, but the pollen shows a wide range of variation from a primitive 3-colpate type, to more advanced types, 12-colpate, 15-colpate and pantoporate, which are well represented.

Literature Cited

Bentham. G. 1839. Observations on some genera of plants connected with the flora of Guiana. Trans. Linn. Soc. London. **18:** 225-238.

——— & J. D. Hooker. 1883. Genera Plantarum **3:** 1-87.

Bertero, C. 1828. Continuacion del catalogo de plantas observadas en Chile por el doctor Bertero. Mercurio Chileno **1828:** 735-749.

Bessey, C. 1915. The phylogenetic taxonomy of flowering plants. Ann. Missouri Bot. Gard. **2:** 109-164.

Bostick, P. 1965. *In* Documented chromosome numbers of plants. 65: 2. Sida **2:** 165-168.

Brown, N. E. 1909. Flora of Ngamiland. Kew Bull. **1909:** 81-146.

Chodat, R. 1903. *In* Chodat & Hassler, Plantae Hasslerianae, Énumération des plantes récoltées au Paraguay. Bull. Herb. Boiss., ser. 2, **3:** 387-421.

Dreiding, A. S. 1961. The Betacyanins, a class of red pigments in the *Centrospermae,* p. 194-211. *In,* Recent Developments in the Chemistry of Natural Pheonolic Compounds. W. D. Ollis, Editor. Pergamon Press, New York.

Eckardt, T. 1964. *Centrospermae,* p. 79-102. *In* Engler Syllabus der Pflanzenf. **2.** Gebruder Borntraeger, Berlin.

Erdtman, G. 1952. Pollen morphology and plant taxonomy. Angiosperms. Almqvist & Wiksell, Stockholm.

Fassett, N. & J. Sauer. 1950. Studies of variation in the weed genus *Phytolacca*. I. Hybridizing species in northeastern Colombia. Evolution **4**: 332-339.
Hardin, J. 1964. A comparison of *Phytolacca americana* and *P. rigida*. Castanea **29**: 155-164.
Heimerl, A. 1889. *Phytolaccaceae, In* Engler & Prantl, Pflanzenfam. III **1**: 1-14.
———. 1934. *Phytolaccaceae, In* Engler & Prantl, Naturl. Pflanzenfam., ed. 2, IV **16**: 135-164.
Heiser, C. 1963. Numeración cromosómica de plantas ecuatorianos. Cien. Natur. **6**: 2-6.
Hill, A. W. 1912. *Phytolaccaceae*, p. 454-459. *In* W. T. Thistleton-Dyer, Flora Capensis **5**(1).
Howell, J. T. 1960. A mexican pokeberry in San Francisco. Calif. Leafl. West. Bot. **9**: 81-83.
Hutchinson, J. 1959. The Families of Flowering Plants. **1.** Dictotyledons, ed. 2. Oxford University Press, London.
Lewis, W. H., H. L. Stripling & R. G. Ross. 1962. Chromosome numbers for some angiosperms of the southern United States and Mexico. Rhodora: **64**: 147-161.
Macbride, J. F. 1936. *Phytolaccaceae, In* Flora of Peru. Field Mus. Nat. Hist., Bot. Ser. **13**: 546-558.
Mangenot, S. & G. Mangenot. 1958. Deuxieme lists de nombre chromosomiques nouveaux chez diverses dicotyledones et monocotyledones d'Afrique occidentale. Bull. Jard. Bot. Brux. **28**: 315-329.
Metcalfe, C. R. & L. Chalk. 1950. Anatomy of the Dicotyledons. **2.** Oxford University Press, London.
Monachino, J. V. 1952. A new combination in *Schindleria*. Phytologia **4**: 39-41.
Nowicke, J. W. 1967. *In* Chromosome numbers of phanerogams. 2. Ann. Missouri Bot. Gard. **54**: 181.
Roig, J. T. & J. B. Acuna. 1951. *Phytolaccaceae*, p. 134-140. *In* Leon & Alain, Fl. Cuba **2.**
Sauer, J. 1951. Studies of variation in the weed genus *Phytolacca*. II. Latitudinally adapted variants within a North American species. Evolution **5**: 273-279.
———. 1952. A geography of pokeweed. Ann. Missouri Bot. Gard. **39**: 113-125.
Schmidt, O. C. 1923. Drei neue Phytolaccaceen aus Sudamerika. Notizbl. Ber. **8**: 312-314.
Schnack, B. & G. Covas. 1947. Estudios cariológicos en antótitas. Haumania **1**: 32-41.
Sugiura, T. 1936a. A list of chromosome numbers in angiospermous plants, II. Proc. Imp. Acad. Japan **12**: 144.
———. 1936b. Studies on the chromosome numbers in higher plants, with special reference to cytokinesis, I. Cytologia **7**: 544-595.
———. 1937. A list of chromosome numbers in angiospermous plants, III. Bot Mag. Tokyo **51**: 425-426.
Walter, H. 1906. Die Diagramme der Phytolaccacean. Bot. Jahrb. **37**(Beibl. 85): 1-57.
———. 1909. *Phytolaccaceae, In* Engler, Pflanzenr. IV 83 (Heft 39): 1-154.

Appendix

Materials and Methods for Preparing Slides of Pollen by Acetolysis (modified from Erdtman, 1952).

Dried anthers from large flowers or whole dried immature buds of small flowers were dissected and placed in centrifuged tubes and the following procedure was utilized.

1. To the centrifuge tube containing the flower material was added about 5 cc of a mixture 8 parts of acetic anhydride and 1 part concentrated sulfuric acid.

2. It was then heated in a water bath to 98°C for 2 minutes, with gentle stirring.

3. Material was cooled for about 5 minutes, centrifuged[5], and decanted.

[5]Speed and time of centrifugation will vary depending upon the size of the pollen; about 45 seconds at 1000 rpm were used here.

4. To the sediment was added 2-3 cc of 95% ethyl alcohol and sufficient water to fill approximately half the centrifuge tube.

5. The sediment was rinsed through a bronze filter, 200 mesh, then centrifuged, and decanted.

6. The sediment was rinsed twice more with tap water.

7. To the sediment was added about 10 drops of 50% glycerin for about 15 minutes.

8. Material was then centrifuged, decanted, and inverted on filter paper overnight or for 2 hours at 60°C.

9. Using a platinum needle, a small piece of glycerin jelly[6] was rotated in the sediment and placed on a slide.

10. The slide was placed on a warmer at about 80°C; when the jelly melted a cover slip was added, and melted paraffin then added at the cover slip edge, sealing all edges and removing all air.

11. Slides were cooled and excess paraffin removed with xylene.

INDEX OF LATIN NAMES

New taxa are in **boldface** type, all other taxa are in roman type; numbers in **boldface** type refer to descriptions, numbers in roman type refer to synonyms, numbers with dagger (†) refer to names incidentally mentioned.

Achatocarpaceae 295†
Achatocarpus 295†
Adenograma 294†, 295†
Agdestideae 294†, 295†, 359
Agdestioideae 297†, 298†, **355,** 359†
Agdestis 294†, 295†, 296†, 297†, **355;** clematidea **355,** teterrima 355
Aizoaceae 295†
Albertokuntzea 321†; americana 331; coriacea 326; floribunda 325; langsdorffii 324; longifolia 325; macrophylla 329†; parvifolia 330; vauthieri 326
Amaranthaceae 295†, 347†, 360†
Ancistrocarpus 346; hexander 352; maypurensis 352; schrankii 352
Anisomeria 294†, 295†, 296†, 297†, **298,** 299†, 300†, 301†, 359†, 360†; chilensis 300†; coriacea 299†, **300,** 300†; densiflora 299†; drastica 300; fruticosa 299†, 300†, **301;** littoralis 299†, **300,** 310†, 359†
Aphananthe 346
Apodostachys 301; densiflora 302
Barbeuia 294†, 295†, 297†, **358,** 358†; madagascariensis **358**
Barbeuieae 295†, 359†
Barbeuioideae 297†, 298, **358,** 359†
Bridgesia 301; incisifolia 301; spicata 302
Caryophyllales 292†
Centrospermae 294†, 297†, 358†
Ceratococca 346; maypurensis 352
Chenopodiaceae 294†, 295†, 347†, 360†
Chenopodiales 294†, 295†
Chenopodium paniculatum 350
Chlamydosperma 356
Codonocarpus 295†
Crataeva gorarema 320
Didymotheca 294†, 295†
Ercilia 294†, 301
Ercilla 294†, 295†, 297†, 298†, **301,** 302†, 303†, 359†, spicata **302; syncarpellata** 302†, **303;** volubilis 302, 302†
Ficoideae 295†
Flueckigera 342; seguierodes 342
Galenia celosioides 352
Gallesia 294†, 295†, 297†, **320;** gorazema 320; integrifolia **320,** 321†, var. integrifolia **321,** var. **ovata 321;** ovata 321; scorododendrum 320
Galvezia 302; spicata 302
Giesekia 294†, 295†
Gyrostemon 294†, 295†
Gyrostemonaceae 295†
Gyrostemoneae 294†
Hillera secunda 341
Hilleria 294†, 295†, 296†, 297†, 332†, **339,** 339†; elastica 340; latifolia 297†, 339†, **340,** 341†, 359†, var. longifolia 339; longifolia 339†, **339;** meziana 341†; secunda 339†, 341†, **341;** subcordata 358
Ladenbergia 342

[6]Glycerin jelly was prepared as follows: gelatin 50 gm, distilled water 175 ml, glycerin 150 ml, phenol (crystals) 7 gm, and heated until clear and stored in refrigerator.

Ledenbergia 294†, 295†, 297†, 332†, **342,** 342†, 359; macrantha 342†, **343;** peruviana 342†; roseo-aenea 335; seguierioides 342†, **342**
Limeae 294†
Limeum 294†, 295†
Lophiocarpus 294†, 297†, 346†, 347†, **353,** 360†; burchellii 353, 354†; dinteri 353†, **353;** gracilis 353; polystachyus 353†, **353,** 354†, 359†; tenuissimus 353†, **354**
Mapa 343; graveolens 344
Microtea 294†, 295†, 297†, **346,** 347†, 360†; subg. Eumicrotea 347†, 349; subg. Microtea 347†; **347;** subg. **Moquinia** 347†, **349;** subg. Schollera 347†, 347; burchellii 353; celosioides 350; debilis 347†, 348†, **348,** 349†, var. ovata 348, var. rhombifolia 348; foliosa 347†, **351,** 351†; glochidiata 352; gracilis 353; lanceolata 352; longebracteata 347†, **349;** maypurensis 347†, **352,** 359†, ovata 348; paniculata 347†, **350,** 351†, var. latifolia 350; polystachya 353; portoricensis 347†, **348,** 348†, 349†; scabrida 347†, **350,** 351†; scandens 350; sprengelii 352; sulcicaulis 347†, **351,** 351†, tenuifolia 347†, **352;** tenuissimus 354
Microteoideae 295†, 297†, 298†, **346,** 360†
Microthea 346
Mohlana 294†, 339; apetala 340; guineensis 340; latifolia 340; meziana 341; nemoralis 340; secunda 341, var. acuminata 341
Monococcus 294†, 295†, 297†, 332†, **345;** echinophorus **345**
Petiveria 294†, 295†, 297†, 332†, **343;** alliacea 297†, 343†, **344,** var. alliacea **344,** var. grandifolia 344, var. **tetrandra** 344†, **345;** corrientina 344; foetida 344; graveolens 344; hexaglochin 345; hexandria 344; ochroleuca 344; octandra 344; paraguayensis 344; tetrandra 345
Petiveriaceae 295†, 296†
Phaulothamnus 294†, 295†
Phytholacca 303
Phytolacca 294†, 295†, 296†, 297†, 298†, 300†, 301†, 302†, **303,** 304†, 305†, 359†, 360†; subg. Euphytolacca 304†, 305†, 306†, 312; subg. Phytolacca 306†, **312;** sect. Phytolacca 306†, **312;** sect. Phytolaccastrum 304†, 306†, 312; sect. Phytolaccoides 305†, 306†, **319;** subg. Pircunia 304†, 305†, 306†, **307;** sect. Pircunia 306†, **307;** sect. Pircuniastrum 304†, 307; sect. Pircunioides 304†, 306†, **308;** sect. Pircuniophorum 304†, 306†, **309;** subg. Pircuniopsis 304†, 305†, 306†, **309,** 320†; sect. Pircuniopsis 306†, **310;** sect. Pseudolacca 304†, 310; abyssinica 308, 317; acinosa 297†, 304†, 305†, 306†, **307,** 313†; acuminata 312; americana 297†, 304†, 305†, 306†, 317†, **318,** 319†; arborea 311; australis 297†, 305†, 317; bogotensis 305†, 306†, 315, 317, **317,** 318†; brachystachys 304†, 305†, 306†, **317;** chilensis 300†, 301†, 304†, 305†, 306†, **310;** clavigera 320†; cyclopetala 304†, 305†; decandra 313†, 318†; dioica 296†, 297†, 304†, 305†, 306†, 309†, **311;** dodecandra 304†, 305†, 306†, **308;** drastica 300; elongata 308; esculenta 304†, 305†, 307; goudotii 304†, 305†; heptandra 304†, 305†, 306†, **307;** heterotepala 304†, 305†, 306†, **314;** icosandra 305†, 306†, 310†, **312,** 315, 317†, var. angustitepala 312, var. fraseri 312, var. octogyna 315†, var. sessiliflora 312; kaempferi 307; latbenia 304†, 305†; littoralis 300; longespica 312; lutea 308; macrostachya 315; malabarica 312; mexicana 312, 313; meziana 304†, 305†, 305†, **315;** micrantha 304†, 305†, 317; novahispania 312; nutans 304†, 305†; octandra 297†, 305†, 306†, **313,** 315†, 318†, 319†, 320†, var. grandifolia 313; parviflora 317; pekinensis 307; polyandra 304†, 305†; polystigma 315; polystyla 315; populifolia 311; pruinosa 305†, 306†, **319;** purpurascens 305†, 306†, **316,** 317†; resedifolia 307; resediformis 307; rigida 318, 319†; rivinoides 304†, 305†, 306†, **315,** 317†, 359†; rugosa 304†, 305†, 306†, **310;** sanguinea 304†, 305†, 306†, **309,** 310†; scandens 308; sessiliflora 312; stricta 307; tetramera 305†, 306†, **311;** thyrsiflora 304†, 306†, **314;** triqueta 312; venezuelensis 320†; volubilis 302; vulgaris 318; weberbaueri 304†, 305†, 306†, **312**
Phytolaccaceae 294†, 295†, **296,** 297†, 334†, 355†, 356†, 358†, 359†, 360†
Phytolacceae 294†, **298,** 359†
Phytolaccoideae 294†, 295†, 297†, **298,** 359†
Piercea 332
Pircunia 298, 303, 307; abyssinica 308; chilensis 310; dioica 311; drastica 299†, 300; esculenta 307; stricta 307, var. latifolia 307, var. resediformis 307
Pittosporales 295†
Polpoda 294†, 295†
Potamophila 346; parviflora 352
Psammotropha 294†, 295†
Rivina 294†, 295†, 297†, 320†, 332†, **332,** 334†; acuminata 341; affinis 340; americana 336; apetala 340; densiflora 338; dodecandra 336; ehrenbergiana 336; humilis 297†, **332,** 334†, var. scandens 336; inaequalis 341; laevis 332; latifolia 340; moritziana 336; mutisii 336; octandra 336, var. obtusifolia 336; peruviana 335; polyandra 335; portulaccoides 332, 334†: purpurascens 332, 334†; roseoaenea 335;

scandens 336; secunda 341; seguierioides 342
Rivineae 294†, 295†, **332,** 358†, 359†, 360†
Rivinia 332, 334
Rivinoideae 297†, 298†, **320,** 358†
Sarcocoa 302†
Schindleria 294†, 295†, 297†, 332†, **337,** 339†; densiflora 337†, **338;** glabra 337†, 338; mollis 337†, 338; racemosa 337†, **338;** rivinoides 337†, 338; rosea 338; weberbaueri 338
Schollera 346; debilis 348
Seguiera 321
Seguieria 294†, 295†, 296†, 297†, 320†, **321;** sect. Euseguieria 322†, 324, 330†; sect. Seguieria 323†, 324†, **328,** 330†; sect. Seguieriella 322†, 323†, 328†; sect. **Walteria** 323†, **324;** aculeata 331; affinis 323†, 324†, **329;** alberti 324†, **327,** 327†; americana 323†, 324†, **331;** brevithyrsa 323†, 324†, **330;** coriacea 322†, 324†, 326† **326;** elliptica 327, 330; emarginata 324†, **327,** 327†; floribunda 322†, 324†, **325,** 325†; foliosa 322†, 323†, 324†, 325†, **328;** glaziovii 323†, 324†, **329;** guaranitica 323†, 330; inerensis 330; inermis 323†; langsdorffii 323†, **324;** laurifolia 324†, **327;** longifolia 323†, **325;** macrophylla 323†, 324†, **329;** mammifera 323†; pachycarpa 323†, 328; paraguayensis 323†, 324†, **328;** parvifolia 322†, 323†, 324†, **330;** rigida 323†, 329; vauthieri 322†, 324†, **326,** 327†; votschii 323†; wangerinii 323†
Seguierieae 320, 358†
Semonvillea 295†
Solanoides 332
Stegnosperma 294†, 295†, 296†, 297†, **356,** 356†; cubense 356†, **357;** halimifolium 356†, **357,** 359†; watsonii 356†, **356**
Stegnospermeae 294†, 295†, 359†
Stegnospermoideae 295†, 297†, 298†, **356,** 359†
Suriana 301; volubilis 302
Tersonia 294†, 295†
Thouinia integrifolia 320
Tithonia 332
Trichostigma 294†, 295†, 297†, 332†, **334;** octandrum 334†, 335†, **336,** 337†; peruvianum 334†, 335†, **335;** polyandrum 334†, 335†, **335,** 337†; rivinoides 336
Villamilla 334; octandra 336; peruviana 335; polyandra 335; racemosa 338; roseo-aenia 335; tinctoria 335
Wallinia 353; polystachya 353